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Airport Surveillance Radar Model 11 (ASR-11) System Test Plan

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16. Abstract

This document presents the plan for the system test of the Airport Surveillance Radar Model 11 (ASR-11) radar system at Stockton, California, and Eglin Air Force Base, Florida. System integration tests and system operational tests will be conducted in accordance with Federal Aviation Administration (FAA) Acquisition Management System (AMS) guidelines to assess the ASR-11's is operational suitability and effectiveness when integrated into the National Airspace System (NAS).

System integration tests address the ASR-11 interfaces with other NAS subsystems and the end-to-end performance of the ASR-11 when operated in NAS. These performance tests are designed to verify that the ASR-11 meets both NAS-SS-1000 and ASR-11 system requirements.

System operational tests will measure the suitability and effectiveness of the ASR-11 operating in NAS.

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EXECUTIVE SUMMARY

This report presents the plan for the System Test of the Airport Surveillance Radar Model 11 (ASR-11) radar system at Stockton, California, and Eglin Air Force Base, Florida. System Integration tests and System Operational tests will be conducted in accordance with Federal Aviation Administration (FAA) Acquisition Management System (AMS) guidelines to verify that the ASR-11 is operationally suitable and effective and can meet operational requirements when integrated into the National Airspace System (NAS).

System Integration tests address the ASR-11 interfaces with other NAS subsystems and the end-to-end performance of the ASR-11 when operated in NAS. These performance tests are designed to verify that the ASR-11 meets both NAS-SS-1000 and ASR-11 system requirements. A brief description of each System Integration test follows:

a. Surveillance to Automation Systems - Data formats and signal levels will be verified against approved Interface Control Documents (ICDs) for all external interfaces (i.e., ARTS-IIE, ARTS-IIIE, Standard Terminal Automation Replacement System (STARS), Micro-Enroute Automated Radar Tracking System (MicroEARTS). The ASR-11 interface design will be evaluated to ensure that proper redundancy is available and working on data paths. Data throughput and latency measurements under normal and degraded conditions will be made to ensure that ASR-11 data accurately and reliably makes it to the end user.

b. Weather Surveillance to TRACON - The accuracy and resolution of ASR-11 weather data will be verified through comparison with data recorded from an independent weather radar (i.e., NEXRAD) which will be used as a source of truth.

c. Facilities - Equipment shelters will be evaluated to ensure that they provide the environment and infrastructure required to support operation of the radar electronics. Performance of the ASR-11 facility subsystems to radar interfaces will also be verified.

d. ASR-11 to Power Subsystem - ASR-11 data will be recorded while the radar is running on commercial power, backup engine generator power, and the Uninterruptible Power Supply (UPS). The data will be analyzed to ensure that there is no data corruption with any source of power. Smooth and efficient transfer from one power source to another will also be verified.

e. Surveillance Coverage - Data collected during dedicated flight tests and from targets of opportunity will be analyzed to verify that the Primary Surveillance Radar (PSR), Monopulse Secondary Surveillance Radar (MSSR), Surveillance Data Translator (SDT), System Interface Unit (SIU) and automation systems provide coverage of targets within the specified volume.

f. Surveillance Detection - Data collected during dedicated flight tests utilizing targets of known Radar Cross Section (RCS) will be analyzed to determine detection performance of the PSR. Data collected during dedicated flight tests, simulated target injection scenarios, and from targets of opportunity will be analyzed to determine detection performance of the MSSR.

g. Surveillance False Alarm Rate (FAR) - Data collected during dedicated flight tests, simulated target injection scenarios, and from targets of opportunity will be analyzed to determine the FAR performance of both the PSR and MSSR.

h. Surveillance Resolution - Data collected during dedicated flight tests utilizing Global Positioning System (GPS) equipped aircraft with known RCS will be analyzed to determine resolution capabilities of both the PSR and MSSR. MSSR resolution will also be tested utilizing the Aircraft Reply and Interference Environment Simulator (ARIES) test set. ASR-11 resolution test results will be evaluated to ensure that the ASR-11 adequately supports the use of existing aircraft separation standards and procedures.

i. Surveillance Accuracy - Data collected during both targets of opportunity and dedicated flight tests utilizing GPS equipped aircraft will be analyzed to determine the positional accuracy of the PSR and MSSR.

j. MSSR Performance - The ARIES test set will be used to inject various target and FRUIT scenarios into the MSSR.

k. Surveillance Capacity and Delay - Target report data will be collected under a capacity load at various points in the output data stream and analyzed to assess probability of detection (Pd) and latency performance. ARIES will be utilized to inject simulated beacon target loads. A PSR target load will be simulated by tilting the antenna downward to increase the number of primary returns from clutter.

l. RMS Operation - System and facility control functions will be exercised at all system control points (i.e., local and remote SCDIs and local and remote Radar Control Panels (RCPs) to verify proper operation. Accuracy of reported system/facility status and alarms will be verified at each monitoring and control position.

m. ASR-11 versus ASR-7 Comparison - Comparisons of ASR-11 and ASR-7 performance will be made on side-by-side PPI displays on the fourth floor of the Stockton tower.

n. Transition Switchover - Functions provided in the Data Translation Equipment (DTE) for switchover between the ASR-7 and the ASR-11 will be exercised to verify proper operation. Switchover procedures will be executed to determine the amount of time required to fully transition the ARTS-IIE from operation with one radar system to the other.

Operational Test and Evaluation (OT&E) operational tests measure the suitability and effectiveness of the ASR-11 operating in NAS. A brief description of each OT&E Operational test follows:

a. Functional Performance - Air Traffic Controller Evaluations - Air Traffic Controllers will evaluate the effectiveness and suitability of the ASR-11 for controlling traffic. The radar will be evaluated to determine acceptability of target and weather information on the Plan Position Indicator (PPI), acceptability of the VDCU and RCP human interfaces and to assess system performance in normal and degraded modes of operation.

b. Functional Performance - AF Evaluations - Trained Airways Facilities technicians will evaluate the effectiveness and suitability of ASR-11 training, documentation and automatic Built-In Test (BIT)/ Fault Isolation Test (FIT) features for maintaining the system and certifying its performance on a daily basis.

c. Reliability, Maintainability, Availability (RMA) - RMA parameters will be evaluated through analysis of pertinent data collected throughout System Test and from simulated maintenance operations performed by trained AF field personnel.

d. Site Adaptation and Optimization - Effectiveness of optimization tools and procedures will be evaluated during Government optimization of the radar. Controller evaluations will be utilized to determine if the system is capable of adapting to environmental conditions without frequent reoptimization.

e. Human Factors - Trained Air Traffic Controllers and AF technicians will evaluate acceptability of OMT and RCP human interfaces.

f. Safety - System and facility equipment will be inspected by OSHA specialists and site personnel to verify that the implemented design and construction reduces the potential for personal injury during installation, maintenance, and operation.

g. Security - The effectiveness of facility security features will be evaluated by site and region personnel. System design will also be evaluated to determine if sufficient measures are provided to prohibit unauthorized access to restricted data and operations.

h. Logistics - Supplied maintenance equipment will be verified to ascertain if it is sufficient to properly maintain the system and facilities. Tests will be performed to verify that essential logistics support is in place. In addition, a test to determine the adequacy of depot response time will be performed. Operation, maintenance and training manuals for all system and facility equipment will be reviewed to determine if existing documentation is complete and sufficient to support the ASR-11's mission.

1. INTRODUCTION.

1.1 BACKGROUND.

The Digital Airport Surveillance Radar (DASR) system is a Non-Developmental Item (NDI) S-Band Airport Surveillance Radar (ASR) designated by the Federal Aviation Administration (FAA) as the Airport Surveillance Radar (ASR) Model 11 (ASR-11). The United States Air Force (USAF) and the FAA are jointly procuring the ASR-11 as a direct replacement of existing radar and beacon equipment at terminal facilities. These radars are being replaced to: interface to new digital automation systems, improve aircraft detection in clutter, improve reliability, reduce support costs, and provide National Weather Service (NWS) calibrated six-level weather. The ASR-11 consists of a Primary Surveillance Radar (PSR), integrated Air Traffic Control Radar Beacon System (ATCRBS) Monopulse Secondary Surveillance Radar (MSSR), external interfaces and facilities.

1.2 PURPOSE.

This System Test Plan (STP) encompasses all the major components of Operational Test and Evaluation (OT&E), including integration, effectiveness and suitability. It provides the framework for testing that ensures the ASR-11 meets all operational requirements, and resolves all Critical Operational Issues (COIs). It verifies effective integration of the ASR-11 into the National Airspace System (NAS) and its suitability for use in FAA applications.

1.3 SCOPE.

This document is designed to provide guidance for test organizations to verify ASR-11 compliance with operational requirements. The STP includes information on required test resources, personnel resources, documentation requirements, test activities, scheduling, roles and responsibilities, and training requirements. This information is necessary to conduct ASR-11 OT&E activities in a structured and well-documented manner.

This STP includes the overall design, coordination and activities required in performing OT&E to verify system integration and operational requirements. This plan also provides the following information and assurances necessary to successfully complete the OT&E effort.

a. Identification of requirements to be verified and test configurations to be employed at the OT&E site in Stockton, CA; Federal Aviation Administration (FAA), William J. Hughes Technical Center; and Eglin Air Force Base, FL.

b. Definition of the scope and degree of testing for the ASR-11 OT&E effort.

c. Identification of resources required by OT&E, including the ASR-11, Automation Systems, and test hardware and software. This includes activities requiring support from organizations participating and assisting with the OT&E effort.

d. Assurance that the STP and associated documentation comply with the latest FAA Acquisition Management System (AMS) Test & Evaluation Process Guidelines.

2. DOCUMENTS.

Contract Documents:

F19628-96-D-0038 Digital Airport Surveillance Radar (DASR) Contract

CDRL A002-005-001 Digital Airport Surveillance Radar (DASR) Contract Attachment 6 – System Specification and SRD Cross Reference, Revision D, dated December 1, 1999

CDRL A008-001-3 Interface Control Document, Surveillance Data Translator (SDT) to ARTS IIA (Modified CD-2) and Surveillance Data Translator (SDT) to ARTS IIIA (SRAP), Revision C, dated November 6, 1998

CDRL A008-002-D Interface Control Document for the System Interface Unit (SIU) to STARS, Revision D, dated August 31, 1999

CDRL A008-004-2 Interface Control Document between the Radar and the Data Translator Equipment (DTE), Revision C, dated May 7, 1999

CDRL A011-SCK-1 Stockton Site Activation and Transition Plan (SATP)

CDRL A011-SCK-2 Site Activation and Transition Plan, W. J. Hughes Technical Center, Atlantic City, NJ (Addendum to the Stockton SATP), dated April 23, 1999

CDRL A011-SCK-3 Facilities/Antenna Tower Design (FATD), Stockton Metropolitan Airport, Stockton, CA, dated February 12, 1999

FAA Documents:

FAA Operational Requirements Document for the Airport Surveillance Radar Model 11 (ASR-11), dated October 4, 1993

Final Requirements Document: Airport Surveillance Radar, Model 11 (DRAFT), Version 2

Acquisition Management System Test and Evaluation Process Guidelines, dated December, 1999

FAA Order 1010.51A U.S. National Standard for the IFF Mark X (SIF) Air Traffic Control Radar Beacon System Characteristics, dated March 8, 1971

FAA Order 1050.15a Fuel Storage Tanks at FAA Facilities, dated April 30, 1997

FAA Order 3910.3a Radiation Health Hazard and Protection

FAA Order 6050.32a	Spectrum Management Regulations and Procedures Manual, dated May 1, 1998
FAA-STD-019b	Lightning Protection, Grounding, Bonding, and Shielding Requirements for Facilities, dated August 28, 1990
FAA-STD-020b	Transient Protection, Grounding, Bonding and Shielding Requirements for Electronic Equipment, dated May 11, 1992
FAA-C-1217e	Electrical Work, Interior, dated January, 1991
FAA-C-1244c	Installation of Engine Generators and Fuel Tanks, dated May 1991
FAA-E-2065	Security Fencing for Facilities, dated August 28, 1973
FAA-E-2204d	Diesel Engine Generators, 10 kW to 750 kW, dated July 1993
FAA-G-2100F	Electronic Equipment, General Requirements, dated November 15, 1993
NAS-IR-34120001	Interface Requirements Document, Terminal Surveillance Radar/Terminal Air Traffic Control System, dated August 8, 1996
NAS-IR-34002105	Surveillance Systems to Standard Terminal Automation Replacement System (STARS) ASTERIX Interface for Surveillance and Weather, Draft, dated April, 1995
NAS-SS-1000	NAS System Specification
ICD SE007-3E	ASR-9 External Interface Control Document for ASR-9 to SCIP, dated April 29, 1988
ICD SE007-4E	ASR-9 External Interface Control Document for ASR-9 SCIP to Terminal Computer, dated June 8, 1989

Military Standards:

MIL-STD-470B	Maintainability Program for Systems and Equipment, dated May 30, 1989
MIL-STD-1472	Human Engineering Design Criteria for Military Systems, Equipment, and Facilities

Other Government Documents:

CFR Title 29, Part 1910Occupational Safety and Health Administration (OSHA)

CFR Title 40, Part 280Technical Requirements, Environmental Protection Agency (EPA)

CFR Title 47, Part 300National Telecommunications and Information Administration (NTIA) Manual of Regulations and Procedures for Federal Radio Frequency Management, dated May, 1994

Commercial Documents:

ANSI C.2	American National Standards Institute (ANSI), National Electric Safety Code
ANSI C95.1	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, dated 1991
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE), Inc., Handbooks and Standards
IEC 61000-4-2	Electromagnetic Compatibility (EMC) – Part 4-2: Testing and Measurement Techniques – Electrostatic Discharge Immunity Test, dated 1999
IEC 61000-4-3	Electromagnetic Compatibility (EMC) – Part 4-3: Testing and Measurement Techniques – Radiated Radio-Frequency, Electromagnetic Field (EMF) Immunity Test, dated 1991
IEEE 473	IEEE Recommended Practice for an Electromagnetic Site Survey (10 kHz to 10 GHz), dated 1985
IEEE C63.14	American National Standard Dictionary for Technologies of Electromagnetic Compatibility (EMC), Electromagnetic Pulse (EMP), and Electrostatic Discharge (ESD) (Dictionary of EMC/EMP/ESD Terms and Definitions), dated 1998
IEEE C95.1	IEEE Standards for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, dated 1991
IEEE 1100	Institute of Electrical and Electronics Engineers (IEEE) Recommended Practice for Powering and Grounding Sensitive Electronic Equipment, dated 1992
ICAO Annex 10	Volume 1 to the Convention on International Civil Aviation, dated April 1985, and Amendment 69, International Standards, Recommended Practices and Procedures for Air Navigation Services, dated November 11,

	1993, and Volume IV, Amendment 71, Aeronautical Telecommunication, Surveillance Radar and Collision Avoidance Systems
NFPA 10	National Fire Protection Association (NFPA), Portable Fire Extinguishers, dated 1992
NFPA 70	National Electric Code (NEC), dated January 1, 1999
NFPA 72	National Fire Alarm Code, dated 1996
NFPA 780	Standard for the Installation of Lightning Protection Systems, dated 1997
UL 96A	Underwriters Laboratories (UL) Inc., Installation Requirements for Lightning Protection Systems, dated July 8, 1998
UL 1449	Transient Voltage Surge Suppressors, dated October 19, 1998
UL 1778	Uninterruptible Power Supply Equipment, dated 1992

3. SYSTEM DESCRIPTION.

3.1 SYSTEM OVERVIEW.

The ASR-11 is a turnkey program to replace aging ASR-7s, ASR-8s, and co-located Air Traffic Control Beacon Interrogator (ATCBI) Models 4 and 5. At sites where an ASR-7 or ASR-8 is co-located with a Mode S beacon system, the Mode S system will be relocated and an ASR-11 will be installed at the site. In the terminal radar environment, it will also be used to satisfy new radar siting requirements for terminal surveillance service, including FAA takeover of military facilities. The system features a PSR fully integrated with an ATCRBS MSSR. New technologies are employed in the system design to provide improved detection performance and system reliability while reducing operating costs. It is intended for operation in unmanned facilities and includes extensive integral Built-In-Test/Fault Isolation (BIT/FI) capabilities accessible through a remote NAS Infrastructure Management System (NIMS) proxy agent. It will interface with present and future automation systems to provide air traffic controllers with state-of-the-art aircraft and weather detection in the terminal environment. Surveillance and weather data outputs are fully digital with the capability to produce simultaneous outputs in several formats compatible with FAA and Department of Defense (DOD) automation systems. Figure 3.1-1 illustrates a simplified block diagram of the system.

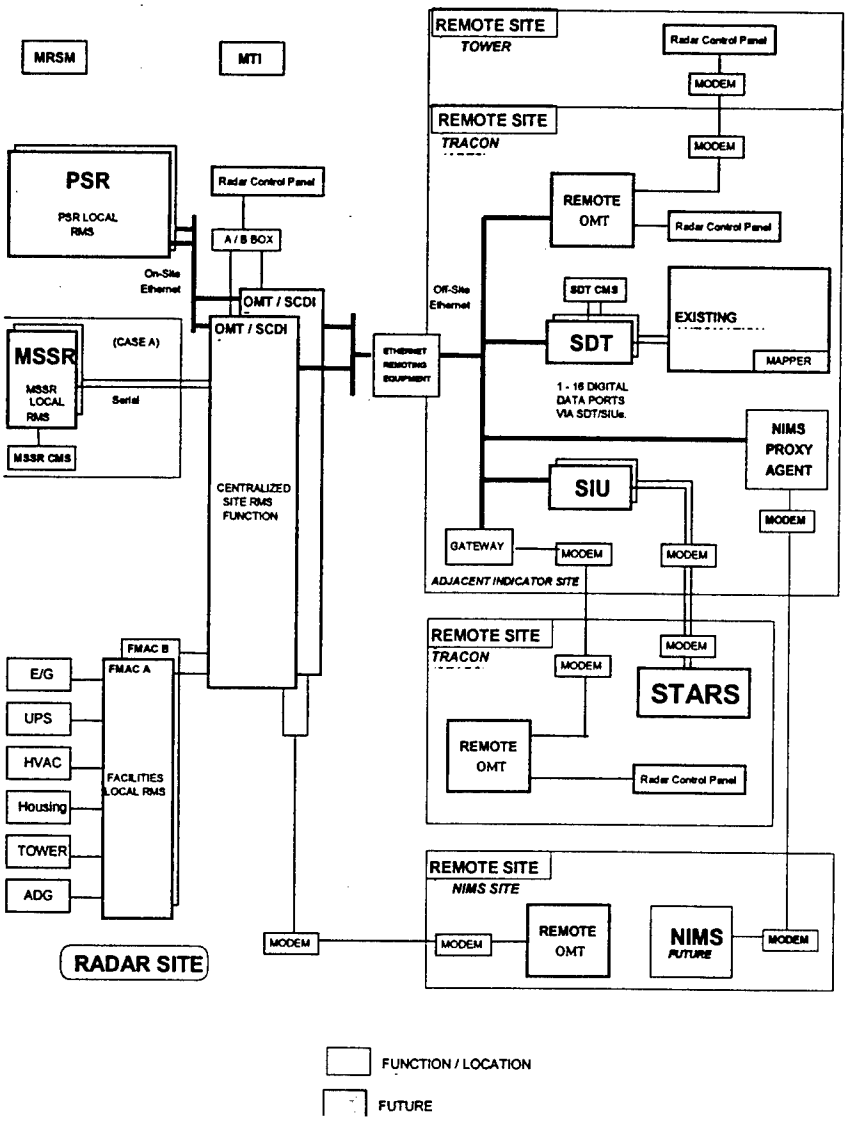


FIGURE 3.1-1. SYSTEM DIAGRAM (FROM DIGITAL AIRPORT SURVEILLANCE RADAR (DASR) SPECIFICATION)

ASR-11 Prime Mission Equipment (PME) consists of the following items:

a. PSR Subsystem

b. ATCRBS MSSR Subsystem

c. Antenna(s)

d. Pedestal Group

e. Tower

f. Radome (when necessary)

g. Local and remote Radar Control Panels (RCP)

h. Operator Maintenance Terminal/Site Control and Data Interface (OMT/SCDI)

i. Remote Operator Maintenance Terminal (OMT)

j. Field level spares

k. Support equipment and technical manuals

l. Electronics equipment shelter(s)

m. Environmental controls

n. Power Conditioning System (PCS)

o. Backup power equipment

p. Moving Target Indicator (MTI) reflectors

q. MSSR Remote System Monitor (MRSM, beacon parrot)

r. External transmission modem system.

s. External interfaces, including the SDT (at all Automated Radar Tracking System (ARTS-II/III) sites), System Interface Unit (SIU), and all interconnecting cabling.

3.2 INTERFACE OVERVIEW.

The block diagram figure 3.1-1 shows the functional interfaces of the ASR-11.

3.3 INTERNAL INTERFACES.

The following ASR-11 internal interfaces will be evaluated during System Test.

a. PSR to Operator Maintenance Terminal/Site Control Data Interface (OMT/SCDI) - Interface provides for exchange of PSR data, status and control with the OMT/SCDI. This includes correlated (tracks) and uncorrelated (plots) search reports and status updates. Data is transferred via 10 Base-T ethernet Local Area Network (LAN).

b. MSSR to OMT/SCDI - Provides for exchange of MSSR target data, status, and control. Interfaces via dual redundant RS-422 serial interfaces.

c. Facilities Monitoring and Control (FMAC) to OMT/SCDI- Provides site status, azimuth encoder information, and facilities control via RS-232 interface.

d. OMT/SCDI to SDT - This interface provides All Purpose Structured Eurocontrol Radar Information Exchange (ASTERIX) messages to the Surveillance Data Translator for translation into Common Digitizer (CD) formats (ARTS-IIE/IIA) and Sensor Receiver and Processor (SRAP) format (ARTS-IIIE/IIIA). The SDT provides status information back to the OMT/SCDI. Data is transferred via a 10 Base-T ethernet LAN, using the Internet Protocol (IP)/Universal Data Protocol (UDP). Fiberoptic transceivers will be used to extend the physical distance between the OMT/SCDI and the SDT.

e. OMT/SCDI to SIU - This interface provides ASTERIX messages to the SIU for translation into formats required for future automation systems, specifically the STARS. The SIU provides indication that it is on line to the OMT/SCDI (once a second heartbeat). Data is transferred via a 10 Base-T ethernet LAN.

f. SCDI to Local Operator Maintenance Terminal - Performs control, Built-In Test (BIT)/Fault Isolation (FI) and configuration of the system at the local radar site through an interface to the SCDI.

g. SCDI to Remote Operator Maintenance Terminals - This interface provides for control, and BIT/FI of system configuration from remote sites. This functionality does not include the ability to modify variable site parameters. Data is transferred via a 10 Base-T ethernet LAN.

h. Radar Control Panel to SCDI/OMT - This interface provides for monitoring and control of the ASR-11 system at the radar site, Terminal Radar Approach Control (TRACON) and Air Traffic Control (ATC) tower. Data is transferred via an RS-232 interface.

3.4 EXTERNAL INTERFACES.

3.4.1 Existing Automation.

Interface to existing equipment is achieved using the Surveillance Data Translator /Digital Video Generators (SDT/DVG). These devices convert IP/UDP messages received from the SCDI via dual redundant ethernet data links to the electrical and mechanical interface protocols required by existing automation systems. The design intent was to mimic the interface implementations of the ASR-9 which are specified in the Interface Control Document (ICD), SE007-4. Although figure 3.1-1 shows one SDT, the SDT is designed such that the software and hardware are configured differently for each automation system. The following systems will be addressed:

3.4.1.1 ARTS-IIIE.

Physical interface to the IIE is accomplished via two isolated and identical interfaces, each consisting of three RS-449/RS-422 serial communication links operating at 9600 bits per second. Data is transmitted in Modified CD-2 format.

3.4.1.2 ARTS-IIIA/IIIE.

Physical interface to the ARTS-IIIA/IIIE is accomplished via two isolated and identical interfaces, each consisting of parallel data (30 data bits, 2 control bits) links operating at 10,000 32 bit data transfers per second. Data is transferred to the ARTS-IIIA/IIIE in SRAP format.

3.4.1.3 MicroEARTS.

Physical interface to the MicroEARTS is accomplished using Modified Common Digitizer (CD)-2 format. Data is transmitted to the SIU via three logical IP/UDP ports. The SIU then forwards data (from 2 of these ports - weather and plot data streams) via a EIA-530/EIA-422-A interface in modified CD-2 format to the automation system via redundant data links.

3.4.2 Future Automation.

3.4.2.1 STARS.

Physical interface to the STARS is accomplished using modified CD-2 format with future expansion to ASTERIX format. Data is transmitted to the SIU via three logical IP/UDP ports. The SIU then forwards data (from two of these ports - weather and plot data streams) via a EIA-530/EIA-422-A interface in modified CD-2 format to the automation system via redundant data links.

3.4.3 Remote Maintenance.

3.4.3.1 Remote Operator Maintenance Terminal.

Provisions are made for interface to a yet undefined remote maintenance terminal through a NIMS proxy agent. This interface is expected to mirror that of a Remote OMT.

4. TEST PROGRAM DESCRIPTION.

4.1 APPROACH AND CONCEPT.

The ASR-11 test program will be accomplished in accordance with the FAA AMS. Testing is divided into three major components: System Test, Field Familiarization, and Independent Operational Test and Evaluation (IOT&E).

The Integrated Product Team (IPT) is responsible for System Test, with test leadership provided by ACT-310. System Test is comprised of Development Test and Evaluation (DT&E), Operational Test and Evaluation (OT&E), and Production Acceptance Test and Evaluation (PAT&E). DT&E is conducted to verify that system function and performance complies with the specification. Formal tests are conducted by the contractor, witnessed by the government, and accomplished in accordance with government approved test procedures. A stable hardware and software baseline must be established and documented prior to completion of DT&E in order for

the test program to proceed. The main objective of OT&E is to determine the operational suitability and effectiveness of the system and facility. Tests are directed towards resolution of the COIs as well as verifying that all operational requirements are met. ACT-310, with support from various FAA organizations, is responsible for the conduct of OT&E. This testing will be performed in an operational environment at the Stockton, California, key site. Additional OT&E testing will be conducted at the DOD key site at Eglin AFB, Florida, and at the FAA Technical Center in New Jersey. PAT&E includes Production Acceptance Test (PAT) and Site Acceptance Test (SAT). PAT will be conducted by the contractor on each production system to ensure that it conforms to the design qualified in DT&E. This testing is performed in the factory and is comprised of a subset of the tests performed as part of DT&E. SAT is performed by the contractor at all field sites prior to government acceptance of the system and facility. Government approved procedures are used for SAT. Successful completion of System Test will lead to an IOT&E Readiness Declaration (IOTRD).

Field Familiarization will be conducted by Air Traffic (AT) and Airways Facilities (AF) personnel at each field site upon completion of installation and checkout and SAT. The primary objective of this testing is to verify that the site is ready for transition from the existing radar system to the ASR-11. Field Familiarization will follow the Contract Acceptance Inspection (CAI) and leads to the Initial Operational Capabilities (IOC) declaration.

The ASR-11 program has been identified by the Associate Administrator for Air Traffic Services (ATS-1) as a program that will be subjected to the conduct of IOT&E. IOT&E will be performed by the Air Traffic Services Test Team (ATSTT), which includes members from the FAA Office of IOT&E, AF, and AT. The ATSTT monitors System Test and conducts IOT&E upon receipt of the IOTRD. Field Familiarization at the key site will also be monitored as part of IOT&E. At the conclusion of testing, the ATSTT will make a determination on the system's operational effectiveness and suitability based on resolution and assessment of the COIs.

4.1.1 Scope of Testing.

This document addresses the OT&E portion of System Test. OT&E testing of the ASR-11 will be divided into two categories; Integration and Operational.

4.1.1.1 OT&E Integration Testing.

Integration testing will be performed to ensure that the system will interface with existing and future NAS equipment without causing degradation to overall NAS performance. Tests are geared towards resolution of the COIs and specifically assess the operational effectiveness of the system. The following parameters, along with a general description of the evaluation method to be employed for each, will be addressed by OT&E Integration testing of the ASR-11:

a. System Optimization: System Variable Site Parameters (VSP) will be adjusted to determine the effects on system performance. Live data will be collected and analyzed to determine the optimum settings for each VSP. Data will be collected and analyzed for various combinations of antenna tilt angles to determine optimum settings for the site.

b. Coverage Volume: Data collected during dedicated flight tests and from targets of opportunity will be analyzed to verify that the PSR, MSSR, SDT, SIU and automation systems provide coverage of targets within the specified volume.

c. Target Detection: Data collected during dedicated flight tests utilizing targets of known Radar Cross Section (RCS) will be analyzed to determine detection performance of the PSR. Data collected during dedicated flight tests, simulated target injection scenarios, and from targets of opportunity will be analyzed to determine detection performance of the MSSR.

d. Target Tracking: Data collected during dedicated flight tests, simulated target injection scenarios, and from targets of opportunity will be analyzed to determine the target tracking capabilities of the system.

e. Target Capacity Loading: Target report data will be collected under a capacity load at various points in the output data stream and analyzed to assess probability of detection (P_d) and latency performance. Aircraft Reply and Interference Environment Simulator (ARIES) will be utilized to inject simulated beacon target loads. A PSR target load will be simulated by tilting the antenna downward to increase the number of primary returns from clutter.

f. False Alarm Rate: Data collected during dedicated flight tests, simulated target injection scenarios, and from targets of opportunity will be analyzed to determine performance of both the PSR and MSSR.

g. Target Split Rate: Data collected during dedicated flight tests, simulated target injection scenarios, and from targets of opportunity will be analyzed to determine performance of both the PSR and MSSR.

h. Target Report Accuracy: Data collected during both targets of opportunity and dedicated flight tests utilizing Global Positioning System (GPS) equipped aircraft will be analyzed to determine accuracy of positional information included in target reports.

i. Target Resolution: Data collected during dedicated flight tests utilizing GPS equipped aircraft with known RCS will be analyzed to determine resolution capabilities of both the PSR and MSSR. MSSR resolution will also be tested utilizing the ARIES test set.

j. Aircraft Separation Standards and Procedures: System performance will be evaluated to ensure that the DASR adequately supports the use of existing aircraft separation standards and procedures.

k. Digital Target Reporting: Surveillance, weather, status, sector mark, and internally generated test target data will be recorded at various points in the output data stream. The contents of these messages will be compared to ASR-11 Interface Control Documents (ICD) for correctness.

l. Weather Detection and Reporting: Weather mapping accuracy, resolution, and intensity reporting will be verified against existing weather radars. This testing will most likely be accomplished at the DOD key site since it has a higher probability of weather activity. NEXRAD data will be utilized to compare data that has been collected by the ASR-11.

m. External Interfaces: Data formats and signal levels will be verified against approved ICDs for all external interfaces. Extensive testing of the ARTS-IIE, Digital Bright Radar Indicator Tower Equipment (DBRITE), and NIMS interfaces will be accomplished at the key site. Output data will be remoted to the Technical Center for testing of the ARTS-IIIA/IIIE, STARS, and Micro-Enroute Automated Radar Tracking System (MicroEARTS).

n. Timeliness of Output Data: Target output data will be collected at various points in the output data stream and analyzed to determine cumulative system latency.

o. Video Display and Control: Video outputs from DVGs will be verified against approved ICDs. The Beacon video data will be recorded and compared to digital beacon reports. Video Display Control Unit (VDCU) control and alignment features will be verified.

p. System Monitoring and Control: System and facility control functions will be exercised at all system control points (i.e., local and remote SCDIs, local and remote RCPs, and NIMS) to verify proper operation. Accuracy of reported system/facility status will be verified at each monitoring and control position.

q. Remote Fault Isolation and Certification: NIMS and remote OMT interfaces will be used to isolate real and simulated nondestructive faults. Internally measured certification parameters reported to the SCDI will be verified with external test equipment.

r. Electromagnetic Interference (EMI)/Compatibility(EMC): An EMI screening test will be conducted to map EMI fields inside the electronics equipment building. Test results will be utilized to determine the existence of personnel hazards due to equipment radiation. A relative Radio Frequency (RF) immunity test will also be conducted to evaluate equipment susceptibility to externally generated RF fields.

s. System Spare Memory: Capabilities for upgrades to system memory will be verified.

t. Data Security, Storage, and Retrieval: System design will be evaluated to determine if sufficient measures are provided to prohibit unauthorized access to restricted data and operations. Adequacy of data storage and retrieval functions will be verified.

u. Facilities Subsystems: Equipment shelters will be evaluated to ensure that they provide the environment and infrastructure required to support operation of the radar electronics. Performance of the ASR-11 facility subsystems to FMAC interfaces will also be verified.

Section 4.4 of this document presents detailed descriptions of the individual tests and evaluation methods to be utilized in verifying these parameters.

4.1.1.2 OT&E Operational Testing.

Operational testing will be performed to assess the degree to which the system can be operated and maintained by users in an operational environment. The goal of this testing is to resolve the COIs that address operational suitability of the system. Portions of this testing will include participation of air traffic controllers and maintenance personnel. These specialists will operate, maintain, and observe the system to identify deficiencies and needed improvements with respect to the COIs. Parameters addressed by this testing, along with a brief description of the evaluation method to be employed, are listed below:

a. Reliability, Maintainability, and Availability (RMA): RMA parameters will be evaluated through analysis of pertinent data collected throughout System Test and from simulated maintenance operations performed by trained AF field personnel.

b. Controller Presentation: Acceptability of target and weather displays on the Plan Position Indicator (PPI) will be verified through controller evaluations.

c. Controller Interfaces: Controller evaluations will be utilized to verify acceptability of the VDCU and RCP human interfaces.

d. Maintenance Interfaces: Trained technicians will evaluate acceptability of OMT and RCP human interfaces.

e. Degraded Operations/Fault Tolerance: Controller evaluations will be utilized to assess system performance in normal and degraded modes of operation.

f. Site Adaptation and Optimization/Reoptimization: Effectiveness of optimization tools and procedures will be evaluated during Government optimization of the radar. Controller evaluations will be utilized to determine if the system is capable of adapting to environmental conditions without frequent reoptimization.

g. Transition and Switchover: Functions provided in the DTE for switchover between the ASR-7 and the ASR-11 will be exercised to verify proper operation. Switchover procedures will be executed to determine the amount of time required to fully transition the ARTS-IIE from operation with one radar system to the other.

h. Performance Verification Targets: Controller evaluations will be utilized to verify that installation and operation of MTI reflectors and MRSM are suitable for operational use.

i. Training: Adequacy of AT and AF training courses will be evaluated through questionnaires and review of course material.

j. Fault Detection and Isolation: Trained AF technicians will utilize all available means (automatic and manual) to isolate real and/or simulated faults to determine if procedures and training are adequate and accurate.

k. Certification: Trained AF technicians will certify the system. The procedures, certification screens, and handbooks needed for certification will be evaluated for accuracy and completeness.

l. Preventive/Corrective Maintenance: Trained AF technicians will perform preventive/corrective maintenance actions to verify that manuals and procedures are complete and accurate.

m. Maintenance Equipment: Supplied maintenance equipment will be verified to ascertain if it is sufficient to properly maintain the system and facilities.

n. Integrated Logistics Support: Tests will be performed to verify that essential logistics support is in place. In addition, a test to determine the adequacy of depot response time will be performed. Operation, maintenance, and training manuals for all system and facility equipment will be reviewed to determine if existing documentation is complete and sufficient to support the ASR-11's mission.

o. Safety: System and facility equipment will be inspected by OSHA specialists and site personnel to verify that the implemented design and construction reduces the potential for personal injury during installation, maintenance, and operation.

p. Facility Security: Site security features will be evaluated by site and region personnel to determine if they are adequate.

4.1.2 Critical Operational Issues/Test Requirement Summary.

COIs for the ASR-11 program are listed below:

a. COI #1 - Coverage: Does the performance and coverage volume of the ASR-11 support air traffic control operations?

b. COI #2 - False Alarm Rate: Does the number and distribution of false target reports from the ASR-11 allow reliable aircraft detection, identification, and tracking consistent with the ATC mission and airspace requirements?

c. COI #3 - Aircraft Separation: Does the ASR-11 resolve closely spaced aircraft with sufficient reliability to allow the controller to maintain separation standards?

d. COI #4 - Reliability, Maintainability, and Availability: Is the RMA of the ASR-11 suitable for incorporation into the NAS when used in an operational environment with the available resources, logistics plan, maintenance procedures, and personnel?

e. COI #5 - Site Adaptation and Optimization: Does the ASR-11 design and procedures allow the radar system to be optimized, adapted to site conditions, and certified in a reasonable time by available maintenance personnel?

f. COI #6 - NAS Interoperability: Is the ASR-11 capable of interfacing and operating effectively with other NAS systems?

g. COI #7 - Safety: Are the operation, maintenance, and facilities of the ASR-11 system safe?

h. COI #8 - Human Factors: Does the ASR-11 provide user friendly interfaces that support operations and maintenance and minimize personnel skill requirements and training time?

i. COI #9 - Weather Detection and Display: Does the ASR-11 provide accurate and reliable weather data suitable for safe aircraft routing by air traffic control?

The Verification Requirements Traceability Matrix (VRTM) in appendix A of this document contains a column that cross-references each requirement to a related COI and the test plan paragraph under which it will be evaluated.

4.1.3. Performance Thresholds.

Performance thresholds for the ASR-11 are listed in the VRTM in appendix A of this document.

4.1.4 Activities Leading To Test.

The following program activities must be accomplished prior to beginning the System Test addressed by this document:

a. DT&E testing must verify that all specification requirements have been met.

b. A stable hardware and software baseline must be established and fully documented.

c. Installation of all radar and facility components at the key site must be completed.

d. The On-site System Readiness Demonstration (OSRD) at the key site must be successfully completed.

4.2 TEST ENVIRONMENT.

OT&E will be conducted primarily at the FAA key site in Stockton, California. Extensive testing of the ASR-11 to ARTS-IIE interface will be accomplished at this site. Surveillance and weather radar output data will be remoted to the William J. Hughes Technical Center, via commercial telephone network, to perform testing of the ARTS-II, ARTS-IIIA, STARS, and MicroEARTS interfaces. Additional testing may also be performed at the DOD key site at Eglin Air Force Base (AFB), Florida.

Traffic loads at the Stockton key site are moderate, with 123,612 instrument operations reported in 1993. Most of this traffic is comprised of commercial aircraft flying into and out of San Francisco and Oakland area airports along airways that traverse Stockton's assigned airspace. Takeoff and approach traffic at the Stockton airport is light, allowing the site to operate on a 16-hour day as control of its airspace is handled by Oakland Center during the early morning hours. The site is affected by several clutter conditions including urban, mountain, woods, ground traffic, angel (birds) and second time around clutter types as well as Anomalous Propagation (AP). Clutter conditions at this site are not extreme, which may lead to a requirement for follow-on testing at other sites. In order to minimize impact on operations, an additional ARTS-IIE, along with associated peripherals and a video mapper, will be installed at Stockton to support the test program.

The DOD key site at Eglin AFB is a joint use site with all ATC operations under military control. The traffic load is light and includes both military and commercial aircraft. The site typically operates on less than a 24-hour day, which will allow time for dedicated testing. Clutter conditions affecting this site include sea, urban, woods, and angel clutter types as well as AP. The site also has a much greater probability of weather activity than Stockton. For this reason, the FAA is currently planning to perform OT&E weather performance tests at the Eglin site. The FAA may also perform evaluations of certain clutter rejection performance parameters at this site if conditions are found to be more stringent than those at Stockton.

4.3 TEST AND ANALYSIS TOOLS.

The following test equipment and analysis tools will be required to support the ASR-11 OT&E test program:

a. ARTS-IIE system and peripherals installed at the Stockton key site and dedicated to the test program.

b. Video mapper installed and integrated with the ARTS-IIE system provided for testing.

c. One small RCS aircraft equipped with ATCRBS and/or Mode S transponder and GPS receiver for P_d, and accuracy testing.

d. Two unequal RCS aircraft, the larger of which has an RCS no more than 8 decibels (dB) greater than the smaller, equipped with the ATCRBS and/or Mode S transponders and GPS receivers for accuracy and resolution testing.

e. Two portable personal computers (PCs) for in-flight GPS data recording.

f. One GPS ground station for accuracy and resolution testing.

g. Technical Center automation system laboratory for interface testing.

h. ARIES for beacon target load, throughput, and False Replies Unsynchronized In Time (FRUIT) environment testing.

i. Radar Beacon Analysis Tool (RBAT) for data reduction and analysis.

j. Integrated Radar Evaluation System (IRES) for data reduction and analysis.

k. Data Reduction (DR) analysis tool for reduction and analysis of recorded ARIES output data.

l. Real-Time Aircraft Display System (RTADS) for remote surveillance display and data recording.

m. Four Pentium PCs for radar data recording and analysis.

n. Beacon Target Extractor Tool (BEXR) for SDT video output analysis.

o. Network Analyzer for cable loss and phase measurements and verification of reported certification parameters.

p. Peak Power Meter for radar output power measurements.

q. Digital Oscilloscope for signal measurements.

r. Spectrum Analyzer for radar and ARIES signal measurements.

s. Multimeter for signal measurements.

t. Pulse Generator.

u. Power Quality Monitor for power quality analysis.

v. Ohmmeter for Grounding, Bonding and Lightning (GB&L) system analysis.

w. Low Resistance Ohmmeter for GB&L system analysis.

x. Temperature and humidity Monitors for Heating, Ventilation, and Air Conditioning (HVAC) analysis.

4.4 TEST AND EVALUATION DESCRIPTIONS.

4.4.1 System Integration Tests.

Integration tests are designed to verify the end to end performance of the ASR-11 when operated in the NAS. Integration tests include verification of ASR-11 performance as well as the interfaces of the ASR-11 with other NAS systems.

4.4.1.1 Surveillance to ARTS-IIE.

4.4.1.1.1 Purpose.

Verify proper performance of the ASR-11 when installed in NAS facilities utilizing the ARTS-IIE.

4.4.1.1.2 Requirements Verified in This Test.

See appendix A for Requirements Details
Requirement # - 45, 46, 47, 48, 49, 50, 51, 640, 739, 740.3, 773, 775, 819, 820, 862 - 873, 877.1 - 887, 889, 890, 892 – 904, 1321, 1323, 1325 – 1327, 1330

4.4.1.1.3 Test Objectives.

a. Verify electrical compatibility between the ASR-11 and the ARTS-IIE.
b. Verify functionality of the SDT features when integrated with an ARTS-IIE.
c. Verify the ability of the SDT/ARTS-IIE interface to handle full system loading.
d. Verify the functionality of the reconfiguration functions of the SDT.
e. Verify data format with ICD's.
f. Monitor faults and data dropouts on the interface.

4.4.1.1.4 Test Location.

The ARTS-IIE interface test will be performed on the fourth floor, Stockton Control Tower, Stockton, CA.

4.4.1.1.5 Test Configuration.

Testing will be conducted on a fully configured ASR-11 system. The test configuration will include the use of an ARTS-IIE automation system and Radar Alphanumeric Display Subsystem (RADS) user displays. See figure 4.4.1.1.5-1.

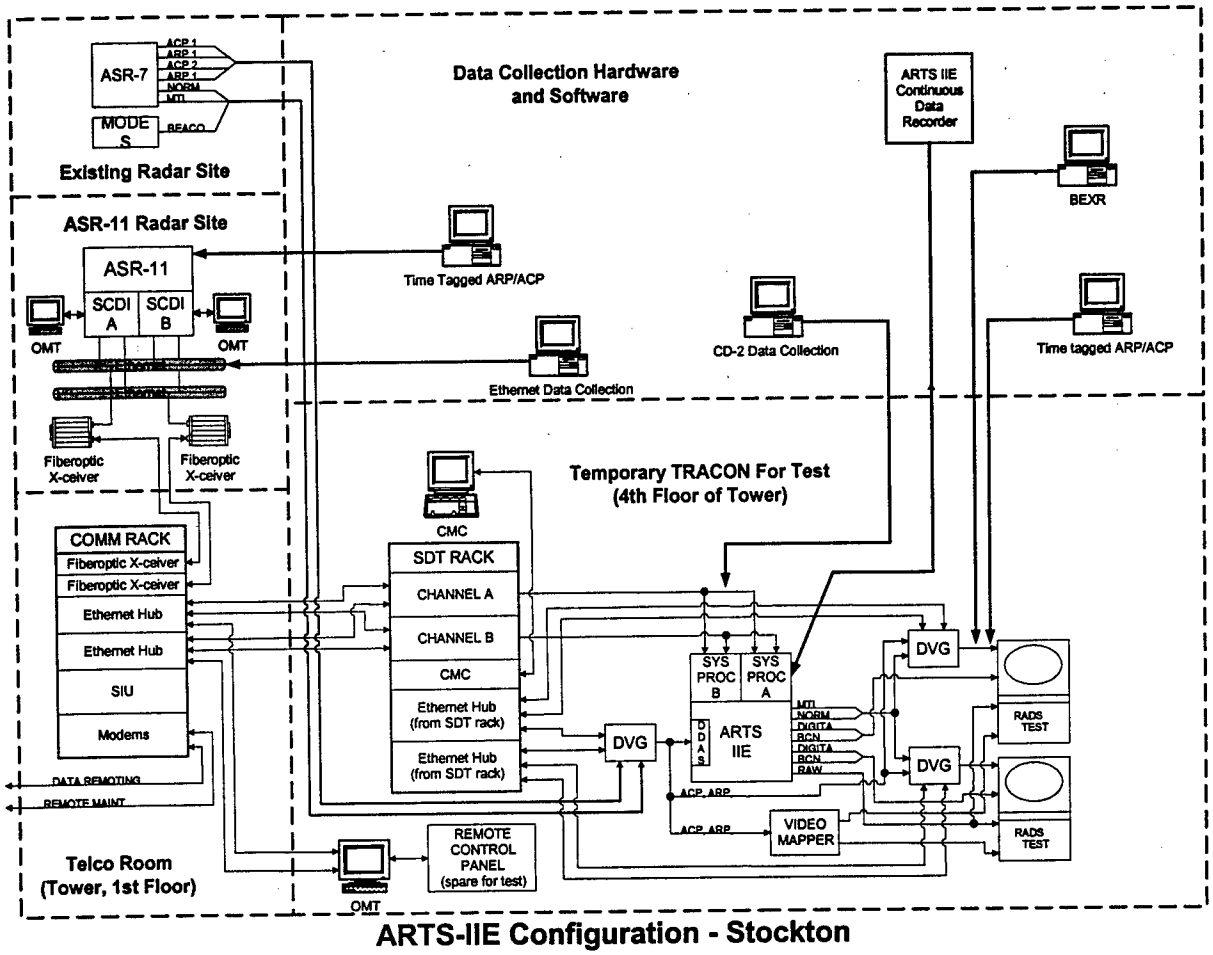


FIGURE 4.4.1.1.5-1. ARTS-IIE CONFIGURATION

4.4.1.1.6 Test Approach.

The ASR-11 interfaces to the ARTS-IIE through the SDT. These tests will verify the electrical characteristics of the interface. In addition, data will be recorded at the input to the SDT, the input to the ARTS-IIE and the output of the ARTS-IIE and compared for expected results. The functionality and correct settings of the VSPs in the SDT will also be verified. User port operation, data formats (including correct transmission of status messages), and degraded operations tests will be performed. Data will be collected on the PSR to OMT/SCDI Ethernet LAN and the OMT/SCDI to SDT Ethernet LAN using a PC to record LAN traffic. Data for the SDT to ARTS-IIE interface will be collected using a PC equipped with an interface card and RRAP software. Video data from the DVG to display interface will be collected using the Commercial Off-The-Shelf (COTS) BEXR tool. Time tagged Azimuth Reference Pulse (ARP)/Azimuth Change Pulse (ACP) data will be collected from the azimuth encoders and at the output of the Digital Video Generators (DVG) to measure display latency. Data will be analyzed to verify proper signal flow from the PSR and MSSR to the display interface and ARTS-IIE.

Electrical characteristics of the interfaces to the ARTS-IIE and the displays will be verified to ensure conformance to specification. Test scenarios will be generated to exercise each bit of the status messages. For each test case, status will be monitored at the OMT, SCDI, RCP, CMC and automation system.

4.4.1.1.6.1 Normal Operation.

Data will be collected under normal operational conditions with all system equipment functional. Message flow and data latency from the PSR/MSSR to the ARTS-IIE and displays will be validated for both targets of opportunity and test targets. During these tests, the functionality of the SDT and DVG display filters, to include radar report quality filters and Range Azimuth Gates (RAG), will be validated by varying display parameters and verifying performance.

4.4.1.1.6.2 Degraded Operations Scenarios.

Data will be collected during the performance of maintenance, system reconfiguration, and injected faults to determine system impacts. Message flow and data latency from the PSR/MSSR to the ARTS-IIE and displays will be validated for both targets of opportunity and test targets. Test cases will include:

a. Nondestructive failure of Remote OMT in control.
b. Nondestructive failure of SCDI/OMT.
c. Nondestructive failure of a Radar Control Panel in control.
d. Nondestructive failure of SCDI/OMT in control (on-line and/or standby).
e. Reconfiguration by Radar Control Panel, Remote OMT, SCDI/OMT.
f. Nondestructive failure of an SDT Channel.
g. Nondestructive failure of DVGs.
h. Recovery of functionality from maintenance mode after failure of OMT/SCDI.
i. Function of the analog interface as on the ARTS-IIE back-up mode.

4.4.1.1.7 Data Analysis Methods.

Recorded data will be analyzed using IRES. Data recorded at different points in the system will be compared to ensure that target reports are not dropped, format conversion works properly, and filtering features in the SDT work. Electrical measurements will be verified against the ICD using standard test equipment (oscilloscope and logic analyzer).

4.4.1.1.8 Test Resources.

a. ASR-11 Site – Stockton
b. IBM Compatible PCs-5
c. NetXray- 2 (for ethernet data collection)
d. Serialtest – (for MSSR data collection)
e. GPS cards – 5 (for time synchronization of data collection hardware)
f. ARP/ACP data collection circuit cards

g. RBAT
h. IRES
i. RRAP Software
j. MX-6A Interface Card
k. BEXR

4.4.1.2 Surveillance to ARTS-IIIE.

4.4.1.2.1 Purpose.

Verify proper performance of the ASR-11 when interfaced to the ARTS-IIIE.

4.4.1.2.2 Requirements Verified in This Test.

See appendix A for Requirements Details
Requirement # - 45, 46, 47, 48, 49, 50, 51, 640, 739, 740.3, 773, 775, 819, 820, 862, 864 - 871, 874, 875, 877.1 - 887, 889, 890, 892 - 904, 1321, 1327

4.4.1.2.3 Test Objectives.

a. Verify electrical compatibility between the ASR-11 and the ARTS-IIIE.
b. Verify functionality of the SDT VSPs when integrated with an ARTS-IIIE.
c. Verify the ability of the SDT/ARTS-IIIE interface to handle full system loading.
d. Verify the functionality of the reconfiguration functions of the SDT.
e. Verify data format comparison with ICDs.
f. Monitor faults and data dropouts on the interface.

4.4.1.2.4 Test Location.

The ARTS-IIIE interface test will be performed at the William J. Hughes Technical Center automation laboratory.

4.4.1.2.5 Test Configuration.

Data from the Stockton ASR-11 will be remoted to the ARTS-IIIE at the FAA William J. Hughes Technical Center. The test configuration is shown in figure 4.4.1.2.5-1.

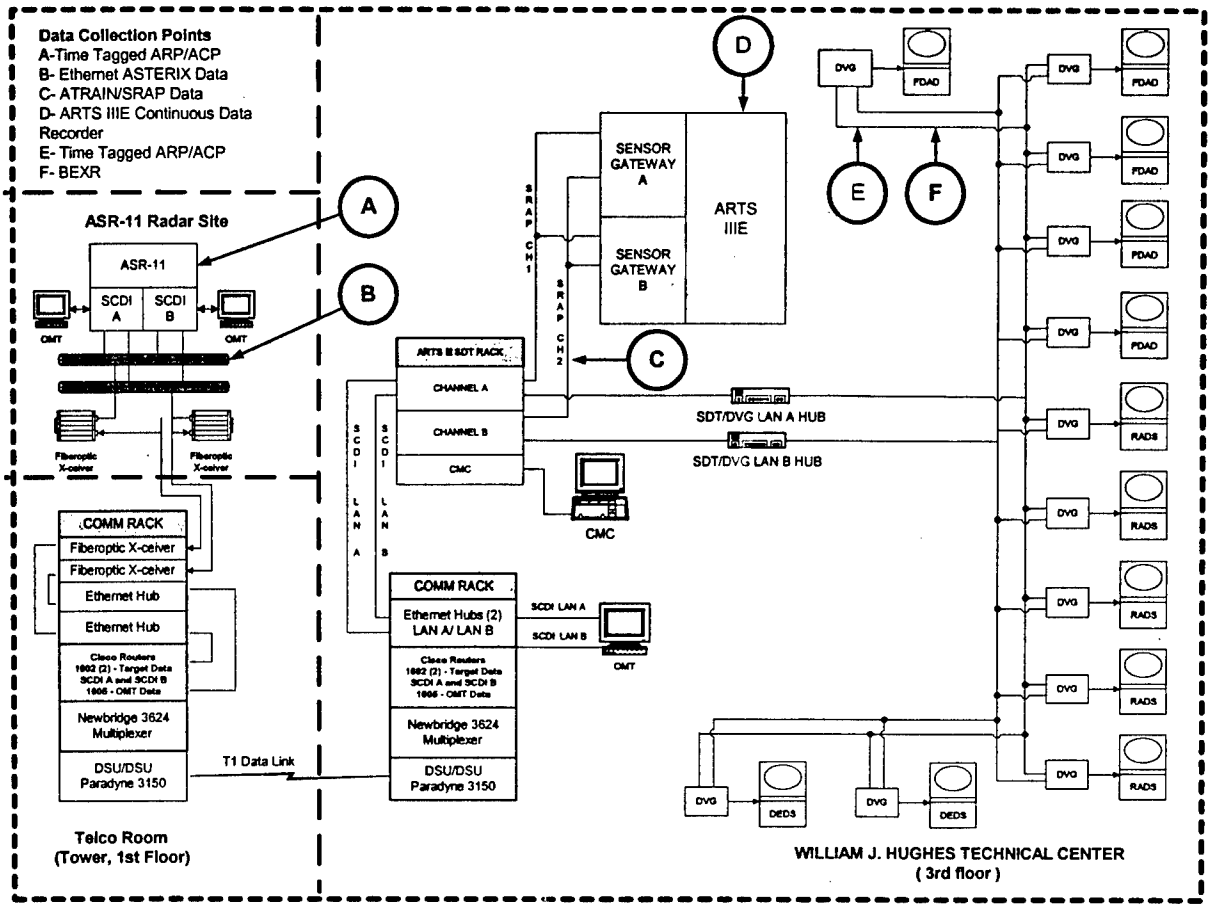


FIGURE 4.4.1.2.5-1. ASR-11/ARTS-IIIE TEST CONFIGURATION

4.4.1.2.6 Test Approach.

The ASR-11 interfaces to the ARTS-IIIE through the Surveillance Data Translator. These tests will verify the electrical characteristics of the interface. In addition, data will be recorded at the input to the SDT, the input to the ARTS-IIIE and the output of the ARTS-IIIE and compared for expected results. The functionality and correct settings of the Variable Site Parameters in the SDT will also be verified. User Port Operation, Data Formats (including transmission of status messages), and Degraded Operations tests will be performed. Data will be collected on the PSR to OMT/SCDI Ethernet LAN and the OMT/SCDI to SDT Ethernet LAN (on both sides of the communications bridge) using a PC with ethernet network interface cards connected to the respective LAN hubs. COTS LAN data collection software (NetXRay) will be used in the PC to record LAN traffic. Data for the SDT to ARTS-IIIE interface will be collected using a PC equipped with an ARTS-IIIA/ Portable Autonomous Radar Collection System (PARCS) interface card and software. Video data from the DVG to display interface will be collected using the COTS BEXR tool. Time tagged ARP/ACP data will be collected from the azimuth encoders at the PSR and at the output of the DVGs to measure display latency. Data will be analyzed to verify proper signal flow from the PSR and MSSR to the display interface and ARTS-IIIE. Electrical characteristics of the interfaces to the ARTS-IIIE and the displays will be verified to

ensure conformance to specification. Test scenarios will be generated to exercise each bit of the status messages. For each test case, status will be monitored at the remote OMT (FAA William J. Hughes Technical Center), SCDI, RCP, CMC, and automation system.

4.4.1.2.6.1 Normal Operations.

Data will be collected under normal operational conditions with all system equipment functional. Message flow and data latency from the PSR/MSSR to the ARTS-IIIE and displays will be validated for both targets of opportunity and test targets. During these tests, the functionality of the SDT and DVG display filters, including radar report quality filtering and RAGs, will be validated by varying display parameters and verifying performance.

4.4.1.2.6.2 Degraded Operations Scenarios.

Data will be collected during the performance of maintenance activities and system reconfigurations to determine system impacts. Message flow and data latency from the PSR/MSSR to the ARTS-IIIE and displays will be validated for both targets of opportunity and test targets. Test cases will include:

a. Nondestructive failure of Remote OMT in control.
b. Nondestructive failure of SCDI/OMT.
c. Nondestructive failure of an Radar Control Panel in control.
d. Nondestructive failure of SCDI/OMT in control.
e. Reconfiguration by Radar Control Panel, Remote OMT, SCDI/OMT.
f. Nondestructive failure of an SDT Channel.
g. Nondestructive failure of DVGs.
h. Recovery of functionality from maintenance mode after nondestructive failure of OMT/SCDI.

4.4.1.2.7 Data Analysis Methods.

Recorded data will be analyzed using IRES. Data recorded at different points in the system will be compared to ensure that target reports are not dropped, format conversion works properly, and filtering features in the SDT work. Electrical measurements will be verified against the ICD using standard test equipment (oscilloscope and logic analyzer).

4.4.1.2.8 ARTS-IIIE Resources.

a. ASR-11 Site – Stockton
b. IBM Compatible PCs-5
c. NetXray- 4 (for ethernet data collection)
d. Serialtest - (for MSSR data collection)
e. GPS cards – 6 (for time synchronization of data collection hardware)
f. ACP Count Time Synchronization Card
g. RBAT

h. IRES
i. ATRAIN Software
j. ATRAIN Interface Card
k. BEXR
l. Newbridge 3624 multiplexes - 2
m. Paradyne 3150 CSU/DSU - 2
n. Leased Lines
o. Local Loop
p. PARCS

4.4.1.3 Surveillance to STARS.

4.4.1.3.1 Purpose.

Verify proper performance of the ASR-11 when interfaced to STARS.

4.4.1.3.2 Requirements Verified in This Test.

See appendix A for Requirement Details
Requirement # - 51, 56, 640, 739, 740.3, 773, 819, 820, 901, 902, 903, 1321, 1327

4.4.1.3.3 Test Objectives.

a. Verify electrical compatibility between the ASR-11 and the STARS.
b. Verify functionality of the SIU VSPs when integrated with the STARS.
c. Verify the ability of the SIU/STARS interface to handle full system loading.
d. Verify the functionality of the reconfiguration functions of the SIU.
e. Verify data format with ICDs.
f. Monitor faults and data dropouts on the interface.

4.4.1.3.4 Test Location.

The STARS interface test will be performed at the William J. Hughes Technical Center automation laboratory.

4.4.1.3.5 Test Configuration.

Data from the Stockton ASR-11 will be remoted to the STARS at the FAA William J. Hughes Technical Center. The test configuration is shown in figure 4.4.1.3.5-1.

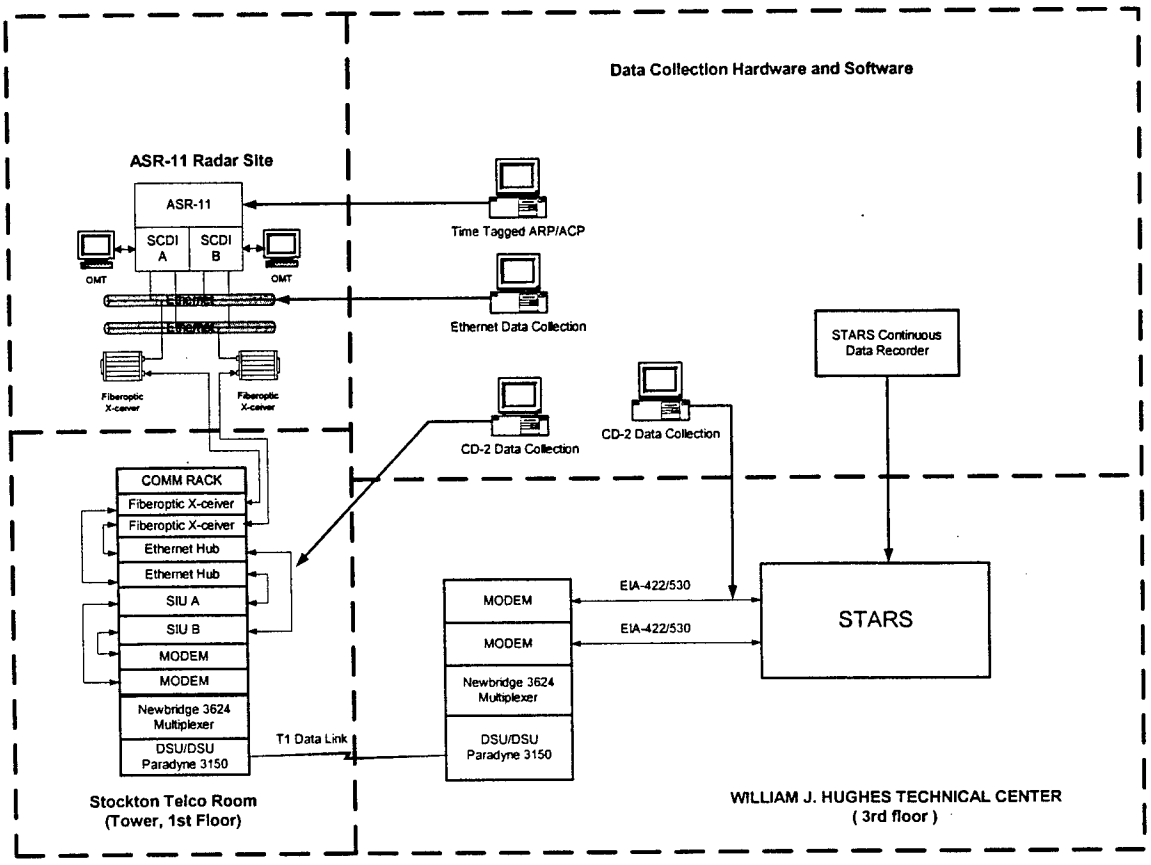


FIGURE 4.4.1.3.5-1. STARS CONFIGURATION

4.4.1.3.6 Test Approach.

The ASR-11 interfaces to STARS through the SIU. These tests will verify the electrical characteristics of the interface. In addition, data will be recorded at the input to the SIU, the input to STARS and the output of the STARS and compared for expected results. User Port Operation, Data Formats (including correct transmission of status messages), and Degraded Operations tests will be performed. Data will be collected on the PSR to OMT/SCDI Ethernet LAN using a PC with an ethernet network interface card connected to the LAN hub. COTS LAN data collection software (NetXRay) will be used in the PC to record LAN traffic. Data for the SIU to STARS interface will be collected using a PC using a CD-2 record board. Time tagged ARP/ACP data will be collected from the azimuth encoders at the PSR and at STARS to measure data latency. Data will be analyzed to verify proper signal flow from the PSR and MSSR to the STARS. Electrical characteristics of the interface will be verified to ensure conformance to the ICD. Test scenarios will be generated to exercise each bit of the status messages to and from the SIU. For each test case, status will be monitored at the remote OMT (FAA William J. Hughes Technical Center), SCDI, RCP, and the automation system.

4.4.1.3.6.1 Normal Operation.

Data will be collected under normal operational conditions with all system equipment functional. Message flow and data latency from the PSR/MSSR to STARS will be validated for both targets of opportunity and test targets.

4.4.1.3.6.2 Degraded Operations Scenarios.

Data will be collected during the performance of maintenance and reconfigurations to determine system impacts. Message flow and data latency from the PSR/MSSR to STARS. Test cases will include:

a. Nondestructive failure of Remote OMT in control.
b. Nondestructive failure of SCDI/OMT.
c. Nondestructive failure of an Radar Control Panel in control.
d. Nondestructive failure of SCDI/OMT in control.
e. Reconfiguration by Radar Control Panel, Remote OMT, SCDI/OMT.
f. Nondestructive failure of an SIU Channel.
g. Recovery of functionality from maintenance mode after nondestructive failure of OMT/SCDI.

4.4.1.3.7 Data Analysis Methods.

Recorded data will be analyzed using IRES. Data recorded at different points in the system will be compared to ensure that target reports are not dropped, format conversion works properly, and filtering features in the SDT work. Electrical measurements will be verified against the ICD using standard test equipment (oscilloscope and logic analyzer).

4.4.1.3.8 Test Resources.

a. ASR-11 Site – Stockton
b. IBM Compatible PCs-4
c. NetXray- 1 (for ethernet data collection)
d. Serialtest – (for MSSR Data Collection)
e. GPS cards – 4 (for time synchronization of data collection hardware)
f. ACP Count Time Synchronization Card
g. RBAT
h. IRES
i. Newbridge 3624 multiplexer - 2
j. DSU/CSU - Paradyne 3150-2
k. Leased Lines
l. Local Loop

4.4.1.4 Surveillance to MicroEARTS.

4.4.1.4.1 Purpose.

Verify proper performance of the ASR-11 when interfaced to MicroEARTS.

4.4.1.4.2 Requirements Verified in This Test.

See appendix A for Requirement Details
Requirement # - 740.4, 819, 820, 901, 902, 903, 1321, 1327

4.4.1.4.3 Test Objective.

a. Verify electrical compatibility between the ASR-11 and MicroEARTS.
b. Verify functionality of the SIU integrated with MicroEARTS.
c. Verify the ability of the SIU/MicroEARTS interface to handle full system loading.
d. Verify the functionality of the reconfiguration functions of the SIU.
e. Verify data format with ICDs.
f. Monitor faults and data dropouts on the interface.

4.4.1.4.4 Test Location.

The MicroEarts interface test will be performed at the William J. Hughes Technical Center automation laboratory.

4.4.1.4.5 Test Configuration.

Data from the Stockton ASR-11 will be remoted to the MicroEARTS at the FAA William J. Hughes Technical Center. The test configuration is shown in figure 4.4.1.4.5-1.

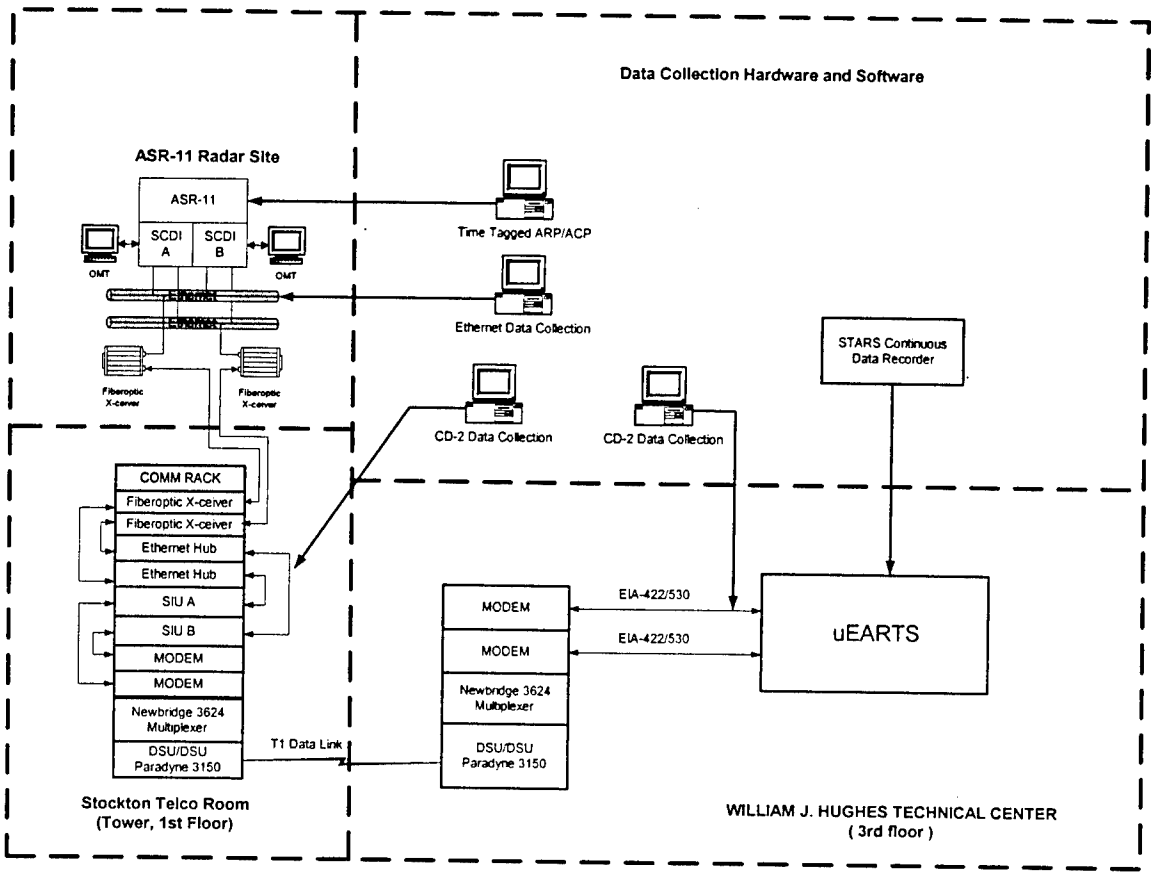


FIGURE 4.4.1.4.5-1. MICROEARTS CONFIGURATION

4.4.1.4.6 Test Approach.

The ASR-11 interfaces to MicroEARTS through the SIU. These tests will verify the electrical characteristics of the interface. In addition, data will be recorded at the input to the SIU, the input to MicroEARTS and the output of the MicroEARTS and compared for expected results. User Port Operation, Data Formats (including correct transmission of status messages), and Degraded Operations tests will be performed.

Data will be collected on the PSR to OMT/SCDI Ethernet LAN using a PC with a network interface card connected to the respective LAN hubs. COTS LAN data collection software (NetXRay) will be used in the PC to record LAN traffic. Data for the SIU to MicroEARTS interface will be collected using a PC using COTS Serial Test software. Data will be analyzed to verify proper signal flow from the PSR to MicroEARTS. Electrical characteristics of the interfaces to the MicroEARTS will be verified to ensure conformance to the ICD.

4.4.1.4.6.1 Normal Operation.

Data will be collected under normal operational conditions with all system equipment functional. Message flow and data latency from the PSR/MSSR to MicroEARTS will be validated for both targets of opportunity and test targets.

4.4.1.4.6.2 Degraded Operations Scenarios.

Data will be collected as during the performance of maintenance and system reconfigurations to determine system impacts. Message flow and data latency from the PSR/MSSR to MicroEARTS. Test cases will include:

a. Nondestructive failure of remote OMT in control.
b. Nondestructive failure of SCDI/OMT.
c. Nondestructive failure of an Radar Control Panel in control.
d. Nondestructive failure of SCDI/OMT in control.
e. Reconfiguration by Radar Control Planel, Remote OMT, SCDI/OMT.
f. Nondestructive failure of an SIU Channel.
g. Recovery of functionality from maintenance mode after nondestructive failure of OMT/SCDI.

4.4.1.4.7 Data Analysis Methods.

Recorded data will be analyzed using IRES. Data recorded at different points in the system will be compared to ensure that target reports are not dropped, format conversion works properly, and filtering features in the SDT work. Electrical measurements will be verified against the ICD using standard test equipment (oscilloscope and logic analyzer).

4.4.1.4.8 Test Resources.

a. ASR-11 Site - Stockton
b. IBM compatible PCs - 4
c. NetXray - 1 (for ethernet data collection)
d. Serialtest – (for MSSR data collection)
e. GPS cards - 4 (for time synchronization of data collection hardware)
f. ACP Count Time Synchronization Card
g. RBAT
h. IRES
i. Newbridge 3624 multiplexer - 2
j. DSU/CSU - Paradyne 3150 - 2
k. Leased Lines
l. Local Loop

4.4.1.5 Weather Surveillance to TRACON.

4.4.1.5.1 Purpose.

Verify the ability of the ASR-11 to provide (NWS intensity levels 1-6) proper and accurate display of weather data.

4.4.1.5.2 Requirements Verified in This Test.

See appendix A for Requirement Details
Requirement # - 45, 520.2, 521, 524, 524.1, 525, 526, 869, 877.1

4.4.1.5.3 Test Objectives.

a. Verify SDT processes weather reports from the ASR-11 and broadcasts them to all DVGs.

b. Compare the weather recorded by the ASR-11 is similar to that recorded with a reliable weather source, i.e., Next Generation Weather Data (NEXRAD).

4.4.1.5.4 Test Location.

The weather interface test will be performed at both Eglin Air Force Base and Stockton, CA.

4.4.1.5.5 Test Configuration.

The weather interface test will be performed after the ASR-11 weather channel has been optimized by the Government.

4.4.1.5.6 Test Approach.

The primary source for weather evaluation data will be collected by Lincoln Laboratories during DTE-2B at Eglin Air Force Base. This collection effort will be augmented by qualitative assessments of performance during testing of the fully configured system at Stockton, CA.

During weather events of opportunity, weather data will be recorded from the ASR-11 and a NEXRAD Radar. The ASR-11 will be monitored during the complete movement of a storm system through the ASR-11's detection volume. Data collected will be qualitatively compared to that obtained from the NEXRAD radar. The qualitative analysis will look at the shapes of storm cells groups as well as their intensities within the ASR-11 detection volume.

4.4.1.5.7 Data Analysis Methods.

Weather data transmitted to the SDT from the SCDI on the Ethernet data link will be recorded on a PC with an ethernet card using NetXRay. Weather data will be extracted by filtering the data

via the UDP port number assigned to the weather channel. Several ASR-11 weather maps will be plotted and compared with NEXRAD plots for the same time period. The plots will be inspected to ensure that weather is reported in the same areas and that weather levels are similar in those areas.

4.4.1.5.8 Test Resources.

a. ASR-11 site - Stockton, CA
b. PC with Network Interface Card (NIC)
c. Lease Lines
d. NEXRAD Weather Data
e. NetXray software

4.4.1.6 Facilities.

4.4.1.6.1 Purpose.

This test will verify that the radar facility provides the environment and infrastructure required to support operation of the radar electronics. It will also verify performance of the ASR-11 facility subsystems to FMAC interfaces.

4.4.1.6.2 Requirements Verified in This Test.

See Appendix A for Requirements Details
Requirement # 387, 388, 395, 401, 402.1, 403 - 405, 407, 409, 410, 453, 653.1, 661, 663, 668, 793, 818.1, 825.1, 826.1, 827 - 829, 837, 838, 845.1, 1020, 1025, 1033, 1036, 1037, 1078, 1100, 1107.1, 1117, 1118, 1120 - 1123, 1125, 1126.1, 1126.2, 1127 - 1129, 1131, 1132, 1135, 1136, 1157, 1166, 1184, 1199, 1204, 1216, 1246, 1328, 1352, 1358, 1359, 1362 - 1364

4.4.1.6.3 Test Objectives.

a. Verify proper design, installation, and operation of the HVAC system and Environmental Control Unit (ECU).

b. Verify proper design, installation, and operation of facility monitoring and control components and their interfaces to the FMAC.

c. Verify proper design, installation and operation of the tower equipment hoist.

d. Verify that the telephone communications system at the site is properly installed and provides clear communication between intrafacility and external locations.

e. Verify proper installation of MRSM and MTI electronics and antennas.

f. Verify proper operation of all antenna safety interlocks.

g. Verify that contractor supplied as-built drawings are consistent with the finished product.

4.4.1.6.4 Test Location.

The facilities tests will be performed at the Stockton radar, MTI, MRSM, and TRACON facilities.

4.4.1.6.5. Test Configuration.

The ASR-11 radar facility at Stockton includes a built-on-site radar electronics shelter, prefabricated Engine/Generator (E/G) shelter, and antenna tower. These structures are designed to provide an environment and infrastructure that support operation of the radar system.

The radar electronics shelter is constructed from concrete masonry units and provides approximately 725 square feet of floor space. It houses the PSR and MSSR electronics, UPS, and antenna motor controllers. The shelter is equipped with HVAC and smoke and fire detection systems. The HVAC system consists of two independent, redundant units that are designed to maintain an environment within the shelter of 52° - 88° F with a maximum relative humidity of 80 percent. An ECU controls and monitors operation of the HVAC system and provides remote monitoring capabilities through an interface to the FMAC. Operating time of the two HVAC units is automatically balanced through circuitry within the ECU. A fire alarm control panel, which interfaces to smoke and fire detectors located throughout the facility, as well as the FMAC, is also located in this shelter.

The E/G shelter is a prefabricated concrete structure that is anchored to a cast-in-place concrete foundation. The E/G, day tank, battery charger, load bank control panel and automatic transfer switch are located in this shelter. Smoke and fire detectors, which interface with the fire alarm control panel in the electronics shelter, are integrated into this housing. In order to ensure that interior temperatures are maintained at or above 50° F, a heater is also provided.

A 57-foot tower structure is provided to support the antenna pedestal, rotary joint, and PSR and MSSR antennas. An enclosed area on the mezzanine level houses the rotary joint, antenna drive motors, antenna safety switch, and pedestal local control panel. Smoke and fire detectors are also located inside this room. A permanently mounted, electrically powered hoist is provided on the mezzanine level for lifting and lowering of heavy objects.

Four antenna safety interlocks are provided with the system, which, when opened, inhibit transmitter operation and rotation of the antenna. Individual interlocks are opened by either placing the antenna safety switch in the OFF/SAFE position, opening the antenna deck access gate, removing the antenna drive motor handcrank from its stowed position, or removing the antenna stow pin from its stowed position. The status of each is monitored through an interface with the FMAC. During testing of these interlocks, an HP E4418A Peak Power Meter and HP 84812A Peak Power Sensor will be connected to couplers in the PSR and MSSR transmit paths.

The meter will be monitored to verify that both transmitters are inhibited while each interlock is open.

A telephone network is installed at locations throughout the radar site to facilitate communication between the radar electronics shelter, E/G shelter, and tower mezzanine. The network is also interfaced to the external telephone system servicing the site.

The Stockton ASR-11 configuration will include two MTIs and one MRSM. ASR-11 MTIs will be installed at the centerline of Runway 11L/29R (southeast end) and at a 2-nmi reference point east of the airport. Contractor furnished/installed poles will be utilized for mounting of the MTI hardware. The MRSM antenna will be installed on an existing tower located approximately 6 nmi west of the radar site within the Carlos A. Sousa Criminal Justice Center. This is the current location of the Mode S Calibration and Performance Monitoring Equipment (CPME).

Critical components of the facility equipment have remote control and/or monitoring capabilities. These equipments interface with the FMAC to provide end user control/monitoring functionality at the local and remote OMTs and RCPs as well as NIMS. Control/monitoring capabilities are provided for the following facility equipment: E/G, fuel distribution system, Uninterruptable Power Supply (UPS), automatic transfer switch, antenna pedestal group, HVAC, antenna safety interlocks, fire detection system, and site security system. During scheduled facility monitoring and control test events, a PC equipped with a network interface card and NetXRay LAN Sniffer software will be connected to the local LAN at the radar site and used to record status and control messages.

4.4.1.6.6. Test Approach.

AOS-200 personnel will verify proper installation and operation of all HVAC components, including the ECU. Inspections will be conducted to evaluate compliance with installation requirements contained in the Final Requirements Document (FRD) and American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) handbook. Tests that exercise the automatic and manual control features will be executed to verify system operation.

Throughout OT&E testing, performance of the HVAC system in the electronics equipment shelter will be monitored. Logging equipment will be placed outdoors and at various locations within the shelter to monitor and record temperature and humidity readings. The recorded data will be analyzed to verify that the HVAC system is capable of maintaining specified environmental conditions throughout the shelter. Monitoring points will be chosen to identify possible deficiencies in localized airflow due to poor ductwork design and/or unit balancing. Automatic and manual features of the ECU will be fully exercised to verify proper operation. Logging equipment will also be installed in the E/G shelter to monitor performance of the heating system if the local temperature during scheduled testing drops below 50° F.

Control and monitoring capabilities of facilities equipment will be evaluated through scheduled and unscheduled events to verify proper operation and system response. Scheduled tests will be conducted to verify that control and monitoring capabilities function properly from all local and

remote OMTs and RCPs. All available control and monitoring functions will be exercised at each control/monitoring point. Simulated faults will be injected to validate status reporting functions and system response. Prior to execution of these tests, alarm/alert buffers will be flushed. Alarms/alerts will be logged throughout the event. Status reports will be captured on the ASR-11 LAN and analyzed for accuracy and output timeliness. Reported facility alarms/alerts and known failures occurring during unscheduled events will be investigated to determine if they were properly processed and reported to monitoring points.

Proper design and installation of the tower equipment hoist and electrical service will be verified by AOS-200 personnel. Operation of the hoist will be verified by lifting and lowering loads that simulate the weight of expected loads. During these lifting/lowering exercises, power will be removed from the hoist to verify that loads are not dropped in the event of a power failure during use.

Operation of the antenna safety interlocks will be verified by monitoring transmitter output power and antenna rotation while manipulating each interlock circuit. A peak power meter, connected to couplers in the PSR and MSSR transmit paths, will be monitored to ensure that both transmitters are inhibited when interlock circuits are open. Loss of antenna rotation will be visually verified. Proper reporting of transmitter, interlock, and drive motor status will be verified on the local SCDI.

The on-site telephone communications system will be used throughout testing to coordinate test activities. No dedicated tests of the system's operational capabilities are planned. Any deficiencies or anomalies discovered during use under expected operating conditions will be reported.

AOS-200 personnel will inspect the MRSM and MTI installations to verify that design and installation of antenna mounting hardware will prevent misalignment of the antennas as a result of exposure to high wind speeds.

As-built drawings supplied by the contractor will be referenced throughout System testing. Any deficiencies discovered will be reported.

4.4.1.6.7. Data Analysis Methods.

Status data collected from the ASR-11 LAN will be analyzed to ensure that the correct status is reported for all facility equipment. Status and alarm/alert data collected during fault injections will be studied to verify that status changes are properly and immediately reported to monitoring stations. Alarm/alert logs will be examined after unscheduled events to verify proper reporting of all facility equipment faults.

Temperature and humidity data collected within the electronics equipment shelter will be analyzed to determine if an environment of 52 - 88° F and maximum relative humidity of 80 percent is maintained. Multiple collection units within this shelter will be used to locate any possible "hot spots." Data collected within the E/G shelter will be analyzed to determine if the

heating unit is capable of maintaining internal temperatures ≥ 50° F. Data collected outdoors will be compared to that collected inside of both shelters to determine system performance with respect to external operating environments. Alarm/alert logs will be studied in the event that internal environments are not properly maintained to determine possible causes.

4.4.1.6.8 Test Resources.

a. Temperature/Humidity Transmitters (6)
b. PC equipped with LabVIEW software and 16 channel data acquisition card
c. PC equipped with NetXRay LAN Sniffer Software
d. IRES data analysis software
e. HP E4418A Peak Power Meter
f. HP 84812A Peak Power Sensor

4.4.1.7 ASR-11 to Power Subsystem.

4.4.1.7.1 Purpose.

This test will verify proper interface of the ASR-11 to the power subsystem and assess the impact that site power interruptions have on the ASR-11 data sent to the automation systems and displays.

4.4.1.7.2 Requirements Verified in This Test.

See appendix A for Requirements Details
Requirement # 1046, 1060, 1064, 1065, 1066, 1067, 1070.1, 1096, 1096.1, 1103, 1140 - 1143, 1145 - 1147, 1149 - 1157, 1160, 1162, 1163.2, 1164, 1165, 1169.2, 1169.3, 1170, 1171, 1174 - 1176, 1183, 1206, 1208, 1211, 1223 - 1226, 1229, 1232 - 1235, 1247 - 1249, 1251 - 1255, 1258 - 1260, 1260.1, 1261 - 1278, 1281, 1285 - 1291, 1299, 1299.1, 1299.4, 1300 - 1304, 1304.1, 1305 - 1314, 1315.1, 1316 - 1318, 1320.1, 1320.2, 1320.3, 1320.4, 1320.5.

4.4.1.7.3 Test Objectives.

a. Verify no loss or corruption of critical data at the ASR-11 output as a result of power interruption/disturbance at the ASR-11 input.

b. Verify that all operational programs, fixed and dynamic maps, and Customer and Raytheon adaptation parameter settings are not corrupted by power disturbances.

c. Verify that the ASR-11 power subsystem design, installation, and operation is in accordance with National Fire Protection Association (NFPA) 70, FAA-STD-019b, FAA-STD-020b, and FAA-C-1217e.

d. Verify that site GB&L systems are designed and installed in accordance with FAA-STD-019b, FAA-STD-020b, FAA-C-1217e, NFPA 70, and NFPA 780.

e. Verify that contractor supplied Transient Voltage Surge Suppressors (TVSS) protect ASR-11 equipment against power system transients as required by FAA-STD-019b and FAA-STD-020b.

f. Verify proper operation of the ASR-11 UPS, E/G, and automatic transfer switch.

g. Verify that harmonics on the site Alternating Current (AC) power, attributed to the UPS, are ≤ 10 percent.

h. Verify proper transition from commercial power to backup power and back for both automatic and manual initializations.

i. Verify that the UPS is capable of providing continuity of power to the critical power distribution system for at least 5 minutes during a commercial power failure.

j. Verify proper installation and operation of the E/G fuel system in accordance with FAA-STD-1050.15a, FAA-C-1244c, and EPA 40 CFR Part 280.

k. Evaluate system EMI/EMC performance in an installed environment.

l. Verify that the site power distribution system meets the requirements of FAA-G-2100F, paragraph 3.1.2.4.

m. Evaluate site wiring and grounding systems with respect to the recommendations of IEEE 1100.

n. Evaluate susceptibility of system components to Electrostatic Discharge (ESD).

o. Determine acceptability of present grounding system versus expected performance utilizing a signal reference grid.

4.4.1.7.4 Test Location.

These ASR-11 to power subsystem tests will be performed at the Stockton radar and TRACON facilities.

4.4.1.7.5 Test Configuration.

The Stockton ASR-11 power configuration includes a Kohler backup engine generator, capable of assuming the facility load within 10 seconds of detection of commercial power loss or disturbance. The ASR-11 is also equipped with a site UPS as well as a Direct Current (DC) battery system in each of the Receiver Exciter/Signal Data Processor (REX/SDP) cabinets of the PSR. The site UPS is designed to provide continuity of power to the critical power distribution system for a minimum of 5 minutes in the event of loss of commercial power. The UPS units

provide continued power to the ASR-11 equipment until the backup engine generator can come on-line.

Two TVSSs are provided to protect ASR-11 equipment against power system transients. The main TVSS (United Power, Model SPD-S2-S0K-34-F) is located on the load side of the main service disconnect switch. A secondary surge suppression device (Lightning Protection Corporation, Model LPC 2080-8U-G) is installed at the main distribution panel (DP-1) within the radar electronics housing. As part of System Test, identical units will be laboratory tested to verify performance in accordance with the requirements of FAA-STD-019b and FAA-STD-020b. On-site tests may also be conducted to determine if the TVSS devices are correctly specified with respect to radar system design tolerances.

Throughout OT&E, a Dranetz-BMI PP1 power analyzer will be connected to the load side of the automatic transfer switch. The analyzer will monitor voltage and current for each of the three phases and compare this data to preset thresholds. Under normal power conditions (monitored values within thresholds), the analyzer will periodically save a status report to memory. When a power fluctuation occurs, the analyzer will record more detailed data at the time of the event. A sample output of data recorded during a power fluctuation is shown in figure 4.4.1.7.4-1.

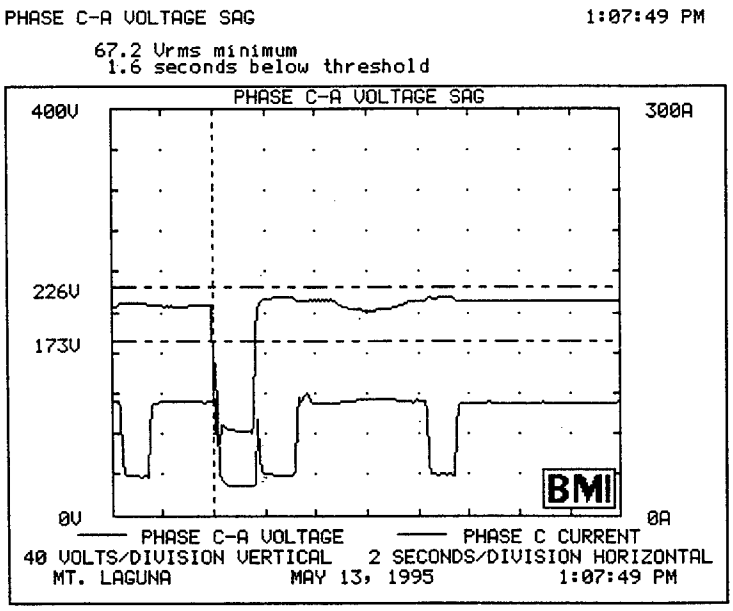


FIGURE 4.4.1.7.4-1. SAMPLE BMI POWER MONITOR DATA

During scheduled power test events, a PC equipped with a network interface card and NetXRay Lan Sniffer software will record surveillance data from the ASR-11 ethernet LAN. A second PC, equipped with an MX-6 card, will record data at the output of the SDT. ASR-11 alarm data will be recorded at the SCDI/OMT.

4.4.1.7.6 Test Approach.

A power coordination study will be conducted by AOS-220 to ensure that the ASR-11 power system design and installation conforms with FAA-STD-019b, FAA-STD-020b, FAA-STD-1050.15a, FAA-C-1217e, FAA-C-1244c, ANSIc.2 (National Electrical Safety Code), NFPA 70 and NFPA 780 requirements. This study will include inspections of the electrical distribution and GB&L systems at the site and TRACON to verify that design and installation is in accordance with specified requirements. An analysis of the power distribution system will be accomplished to ensure that the design and installation includes proper circuit breaker coordination. The E/G, fuel storage/distribution system, battery charger, UPS, automatic transfer switch, and load bank will be inspected to verify that they are installed in accordance with FRD requirements and manufacturer's recommendations.

As part of the coordination study, harmonics on the site AC power will be measured to verify that contributions attributable to the UPS are less than 10 percent. With the UPS isolated from the power distribution system, harmonic measurements will be taken utilizing a Dranetz 658 Power Analyzer. Measurements will be repeated with the UPS connected and operational.

Power loss data will be collected from two sources during OT&E, scheduled and nonscheduled power outages. Scheduled power outages are part of planned tests of the ASR-11 power subsystem. Power interruptions will be effected through manipulation of the main service disconnect switch or feeder branch circuit breakers. Tests of power loss to DTE equipment installed at the TRACON will only be performed with permission from Stockton personnel and are recommended only during off-hours (i.e., at night). Nonscheduled power outages are random interruptions of commercial power service to the site. Data collected during power outages will be analyzed to determine if unexpected data loss, stored data corruption, or system faults are incurred.

Data collected by the PP1 power analyzer will be used to characterize nonscheduled power outages. System alarm data will be continuously logged for reference during these events. Any surveillance data available from recordings during the power loss will be kept for analysis.

Prior to execution of each scheduled power loss, ASR-11 alarm buffers will be flushed. Alarms will then be logged throughout the event. Raytheon and Customer adaptation data and ASR-11 map data will be recorded from the on-line SCDI before and after each event. Adaptation data will also be recorded at the MSSR CMS and the SDT CMS. Surveillance and weather data will be recorded at the ethernet LAN and at the output of the SDT (surveillance data only) for the duration of each event. Display video will also be observed for any anomalies. Status messages will be recorded at the ethernet LAN during scheduled power outages to verify correct and timely dissemination of changes in the power system status. Displayed status at each local and remote OMT and RCP will also be verified.

Scheduled power loss data will be collected during performance of the following tests:

a. Commercial power loss with E/G backup. This test will verify that the E/G is capable of starting and assuming the site load within 10 seconds of commercial power loss. Commercial power loss will be simulated by placing the site main disconnect switch in the "off" position. Automatic transfer switch front panel indicators will be monitored to determine when the site load is assumed by the E/G.

b. Commercial power restoration during E/G operation. This test verifies that the automatic transfer switch will return to commercial power from the E/G when a stable source is available. At the start of this test, the E/G will be supplying power to the site and the main disconnect switch will be in the "off" position. The main disconnect switch will then be placed in the "on" position. The automatic transfer switch will automatically return the site to commercial power after determining that a stable input has been available for a user selectable amount of time. This test will also verify that the E/G automatically shuts down after cycling through a cool down phase following the switch to commercial power.

c. Manual switch-over between commercial and E/G power. This test will verify manual features of the automatic transfer switch, which allow the user to select the site power source. With the site operating on commercial power, the E/G will be manually started. The automatic transfer switch will be placed in manual mode, then switched over to the E/G. After a period of approximately 10 minutes, commercial power will be selected on the automatic transfer switch.

d. Commercial power loss with UPS backup. This test will verify that the UPS is capable of supplying continuous power to the critical power distribution system for a minimum of 5 minutes in the event of commercial power failure without E/G backup. With the site operating on commercial power, the automatic transfer switch in manual mode, the critical power system fully loaded, and UPS batteries fully charged, the main disconnect switch will be placed in the "off" position. The system will be allowed to run until available power from the UPS has been exhausted. Elapsed time will be noted. Commercial power will be restored to determine if the system is capable of recovering without loss or corruption of stored critical parameters.

e. PSR and MSSR power loss. This test will verify proper system response to power loss on individual PSR and MSSR branch circuits. With the system on-line and operational, one of the branch circuit breakers supplying power to either the PSR or MSSR will be switched off. System response will be monitored to verify that expected autoreconfiguration functions are properly performed. The circuit breaker will be switched on after the system stabilizes to verify that affected equipment recovers automatically. The test will be repeated for each circuit breaker and channel configuration (i.e., channel A on-line selected and channel B on-line standby, then channel B on-line selected and channel A on-line standby). REX/SDP internal UPS performance will also be evaluated during this test to determine how long the system will operate on power supplied by these units.

f. DTE power loss. This test will verify operation of the DTE under both short- and long-term power loss conditions. Short-term power losses will be simulated by switching individual branch circuit breakers off, then back on approximately 10 seconds later. Circuit

breakers will be switched off for a minimum of 5 minutes during long-term power loss tests. Equipment will be monitored to verify that autoreconfiguration functions execute properly and that no damage is sustained. Tests will be run with channel A on-line selected and channel B on-line standby, then repeated with the roles reversed. DTE output data will be analyzed to determine the extent of data loss during channel switches.

A consultant specializing in the field of transient protection will be contracted to conduct performance tests on the site TVSSs. Compliance with the transient protection requirements of FAA-STD-019b and FAA-STD-020b will be laboratory tested to avoid possible damage to the radar electronics. Two units, identical to those installed at the site, will be procured for this purpose. Laboratory tests will be conducted in accordance with government approved procedures and will be witnessed by a representative from AOS-220. On-site testing will be conducted if results indicate that the devices perform satisfactorily and that test equipment will not induce surges that exceed protection requirements. This testing will verify that the site TVSS devices are properly specified with respect to susceptibility levels of the radar equipment. On-site tests will be treated like a scheduled power loss for the purposes of data collection.

A power quality consultant will be contracted to perform on-site EMI/EMC, power quality, grounding system, and ESD testing. EMI testing will include mapping of the fields inside the electronics equipment shelter using IEEE 473 as a guide to procedure development. Measurements will be taken under three distinct operating environments; the first with all equipment in the building turned off, the second with all equipment on except the radar system and UPS, and the third with all equipment turned on. Results of this testing will be analyzed with respect to the requirements of IEEE C95.1 to determine if hazardous radiation levels exist within the shelter. Relative RF immunity testing will be conducted in accordance with IEC 61000-4-3 to evaluate EMC performance of the radar electronics. The equipment will be subjected to 10 v/meter. Power quality testing will evaluate the site power distribution system with respect to the requirements of FAA-G-2100F, paragraph 3.1.2.4. Voltage, current, harmonics (2^{nd} through 15^{th}), and related real and reactive powers will be measured and recorded at the service entrance and at the terminals of the ASR-11 equipment. Full voltage and current harmonics will also be measured at the interfaces between equipment and the seven step-down transformers located within the equipment shelter. An overall assessment of the site grounding system will be performed to verify compliance with FAA-STD-019b, FAA-STD-020b, and FAA-C-1217e as well as the recommendations of IEEE 1100. Resistance to earth of the site grounding system will be measured along with currents, from DC to 100 megahertz (MHz), on all equipment grounding conductors, bonding straps, signal reference grounds, building grounding electrode conductors, and the UPS output ground. ESD immunity testing will be performed on all ASR-11 signal processing cabinets (including the DTE and RCP) and the automatic transfer switch microprocessor cabinet in the E/G shelter. This testing will be conducted in accordance with IEC 61000-4-2 and IEEE C63.14 procedures. The EMC and ESD tests will be treated as scheduled power losses for the purposes of government data collection. The combined results of all these tests will be analyzed to determine acceptability of the present grounding system versus expected performance utilizing a signal reference grid.

4.4.1.7.7 Data Analysis Methods.

After each power loss, the BIT/FI results will be analyzed to ensure that there was no equipment damage due to the power loss. Alarm data will be studied to ensure that the expected status of the E/G and UPS equipment was reported via the FMAC interfaces. During nonscheduled events, the cause and effects of the power loss will be examined through time correlation of the alarm, power monitor, and surveillance data recordings.

Surveillance and weather recordings will be analyzed for data anomalies or dropouts during each power loss.

Test log books will be located at the radar site and at the fourth floor test site in the tower. Any anomalies (e.g., on PPIs, with status reporting, etc.) noted during scheduled or nonscheduled outages will be documented in the appropriate test log book. These observations will be correlated with power monitor data, alarm data, and surveillance data when available.

4.4.1.7.8 Test Resources.

a. Dranetz/BMI PP1 Power Analyzer
b. Dranetz 658 Power Analyzer
c. United Power TVSS, Model SPD-S2-S0K-34-F
d. Lightning Protection Corporation TVSS, Model LPC 2080-8U-G
e. PC equipped with ethernet card and NetXRay LAN Sniffer Software
f. PC equipped with CD-2 data recording card
g. IRES Data Analysis Software
h. RBAT Data Analysis Software
i. Stopwatch

4.4.1.8 Surveillance Coverage.

4.4.1.8.1 Purpose.

This test will verify that the ASR-11 provides range, azimuth, and altitude coverage in accordance with the ORD requirements. The primary source of data for this test will be targets of opportunity. Flight tests using dedicated aircraft of known radar cross section will be described in the Surveillance Detection section of this plan.

4.4.1.8.2 Requirements Verified in This Test.

See appendix A for requirement details
Requirement # - 25, 61, 66, 72, 314, 316, 317, 318, 319, 320, 456, 463, 464, 502, 503, 505, 588, 611, 634, 732.1, 732.5

4.4.1.8.3 Test Objectives.

a. Verify that the ASR-11 provides detection of air carrier, military, air taxi, and general aviation aircraft in ground, weather, and anomalous propagation clutter and output accurate, reliable surveillance (range and azimuth) data to ATC facilities, and provides six-level weather detection.

b. Verify that the PSR processes primary radar targets in the detection volume as defined below:

1. Slant Range: 0.5 - 60 nmi

2. Azimuth: 360°

3. Altitude: 0 - 24,000 feet AGL as limited by the elevation coverage requirement

4. Elevation: From local radar horizon as determined by earth curvature, atmospheric refraction, and as further limited by terrain screening to 30° with respect to the horizontal plane at the radar antenna.

c. Verify that the PSR detects all aircraft with the following characteristics which are within the detection volume:

1. Radar Cross-Section: 1 to 10,000 square meters (m^2)
2. Ground Speed: 25 to 700 km

d. Verify that the PSR provides correlated and uncorrelated search reports over the specified detection volume.

e. Verify that the PSR meets coverage requirements with 7 of 8 transmitter modules on-line.

f. Verify seamless PSR detection performance through the short pulse/long pulse transition range and high beam/low beam transition range.

g. Verify that the PSR detects tangentially moving targets within the specified detection limits.

h. Verify that the PSR suppresses combinations of fixed and moving clutter (see applicable parts of the specification clutter table for each test site) while detecting aircraft targets.

i. Verify that the PSR maintains the detection performance through the weather available at the test site.

j. Verify that the PSR detects targets within the specified detection limits when the anomalous propagation filter set is used.

k. Verify that the PSR detects targets within the specified detection limits during periods when pulsed interference conditions exist.

l. Verify that the PSR adaptive plot amplitude thresholding function adequately controls angel activity and does not reduce detection of real targets below specified limits in the areas that they are applied.

m. Verify that the PSR maintains detection performance for targets flying through areas where RAG maps have been set up to control false alarms due to strong clutter or road traffic.

n. Verify that use of primitive zones allows sufficient coverage around sensitive areas (e.g., in the areas of runways).

o. Verify that the PSR tracks targets with velocities from 25 kn through 750 kns throughout the coverage volume.

p. Verify that the MSSR achieves requirements for probability of detection for aircraft equipped with ATCRBS or Mode-S transponders operating over the full range of acceptable limits specified in FAA-Order-1010.51A.

q. Verify that the MSSR processes beacon targets in the detection volume as defined below:

1. Slant Range: 0.5 to 60 nm or 0.5 to 120 nm Azimuth: 360°.

2. Altitude: 0 to 60,000 feet above ground level as limited by the elevation coverage.

3. Elevation: from 0.25° above local radar horizon as determined by earth curvature, atmospheric refraction, and as further limited by terrain screening to 40° with respect to the horizontal plane of the radar.

r. Verify that the MSSR Pd exceeds 0.995 minimum for targets in the site environment. (For this test, MSSR Pd will be measured for round reliability of available targets of opportunity and available FRUIT conditions at the test site.)

s. Verify that the MSSR maintains specified detection through known reflection areas.

t. Verify that MSSR codes are validated 95 percent of the time when four or more replies are received per mode.

u. Verify that MSSR codes are correct at least 99 percent of the time in the presence of FRUIT (available in the test site environment).

v. Verify that the MSSR validates incorrect codes due to fruit or other causes less than 1 percent of time.

w. Verify that the PSR and SSR targets are successfully merged 98 percent of the time

x. Verify that the ASR-11 consistently outputs the following performance monitoring reports:

1. An internally generated uncorrelated search real-time quality control (SRTQC) message once per scan.

2. A formatted correlated SRTQC message once per scan at the same location as the uncorrelated SRTQC but with a unique ID.

3. Target reports from the MTI reflectors within the detection limits of the PSR.

4. An internally generated BRTQC message once per scan.

5. Target reports from the MRSM within the detection limits of the MSSR.

4.4.1.8.4 Test Location - Stockton and Eglin.

4.4.1.8.5 Test Configuration.

The ASR-11 will be optimized by the Government prior to this test (see section 4.2.5 "Site Adaptation and Optimization.") Site adaptation parameters (Customer and Raytheon) will be recorded each day to maintain a record of the state of the system during the coverage test. Comparison to a baseline parameter set will be performed daily. Comparison to a baseline parameter set will be performed daily. In addition, site log books will be inspected prior to each data recording to ensure that the radar is in the expected state. Certification parameters (e.g., PSR and MSSR transmitter power, pulse widths, etc.) will also be fully documented.

Surveillance data will be recorded at the SCDI, at the output of the SCDI (using NetXRay), at the output of the SDT and at the Common ARTS. The Asterix data (recorded at the SCDI) also includes ASR-11 weather data. In addition, clutter maps and A-scope snapshots will be recorded at the SCDI to capture the state of the environment during the test.

Target of opportunity recordings will be made with the radar operated in different configurations (e.g., 7/8 versus 8/8 transmitter modules operating, linear versus circular polarization, normal versus AP filter set). In addition, the effectiveness of ASR-11 false alarm control features (e.g., plot amplitude thresholding, RIS, RAG zones, MSSR permanent reflector files) will be assessed through separate recordings with those features enabled or disabled. Beacon 60 nmi and 120 nmi operation will also be assessed using the PRFs assigned to the test sites.

The coverage requirements will be evaluated for targets flying in the clear and in the clutter available at the test site.

4.4.1.8.6 Test Approach.

The coverage test will be performed using targets of opportunity. (Dedicated flight tests will be performed during the Surveillance Detection and Surveillance Resolution tests.) The test will be performed in the clutter, weather, and interference environment of the test site. Data will be recorded at both the Stockton and Eglin sites in order to test under different environmental and traffic conditions. Priority will be given to recording data during times when AP, weather, or radar interference conditions are prevalent.

Prior to each surveillance data recording, clutter maps will be recorded using the Radar Data Display (RDD) on the local SCDI. Areas of high clutter levels will be identified at that time. Prior to each data recording, A-scope recordings from the RDD will be made to capture any interference. Separate A-scope recordings will be made with the Radar Interference Suppressor (RIS) enabled and disabled. Surveillance data will be recorded while the RIS is enabled. Permanent and dynamic beacon reflector files will also be recorded at the start of each recording.

Details of any PSR or MSSR status changes during data recording will be noted in the test log for use during data analysis. Examples of status changes include switches from Linear Polarization (LP) to Circular Polarization (CP), plot amplitude thresholding becoming active, or system faults.

4.4.1.8.7 Data Analysis Methods.

Data recorded at each point in the system will be analyzed using RBAT and IRES to ensure that the coverage requirements are met for the end-to-end system. Since targets of opportunity are the source of data for this test, the radar cross sections for the targets will not be known. The relative size of the aircraft will be estimated through separate treatment of discrete and nondiscrete beacon targets. In general, nondiscrete coded targets are associated with smaller, general aviation aircraft.

Each data set will be analyzed to ensure that the ASR-11 detects primary and beacon targets within the specified coverage volume limits. Blip scan measurements on individual tracks will enable measurement of the minimum and maximum range, altitude, and elevation coverage at all azimuths.

Data will be analyzed to ensure that the PSR detection requirements are met within the coverage volume with 7/8 or 8/8 transmitter modules on-line and with the system operating in either linear or circular polarization. The coverage volume will be determined for both PSR plots and tracks. Detection performance for targets moving at different speeds will be assessed through separate analysis of slow moving and fast moving tracks from the track data stream.

In addition to the assessment of detection performance at the specified minimum and maximum range, azimuth, and elevation extents of the specification, any holes within the coverage volume will be identified. Data will be analyzed to ensure seamless coverage in the area of the short/long pulse transition and the high/low beam transition range, particularly at high altitudes where the short pulse power is weakest. Data will also be analyzed to determine detection of aircraft flying through primitive zones, if enabled at the test site.

Target detection through areas of clutter, interference, weather, and anomalous propagation will also be assessed. The location and strength of the clutter will be identified using the clutter maps recorded during the test. The location and strength of interference will be identified using the A-scope snapshots recorded during the test. The location and intensity of the weather will be identified using the recorded ASR-11 weather maps. The presence of anomalous propagation will be verified through inspection of the ASR-7 displays and NEXRAD information, if available.

The data will also be analyzed to ensure that the ASR-11 false alarm control mechanisms do not degrade detection performance.

- PSR detection performance will be measured with the RIS enabled.
- PSR detection performance will be measured in areas where plot amplitude thresholding is active. The times and locations of the plot amplitude thresholding will be determined through observations during the data recording.
- PSR detection performance will be measured in areas where RAG zones have been set up (e.g., over roads or in areas of strong clutter).
- Beacon detection performance will also be measured for aircraft flying through areas of known beacon reflectors. Recorded permanent and dynamic reflector files will identify the locations and orientations of the reflecting surfaces.

For each of the target of opportunity recordings, MSSR code validation rates will be calculated. The accuracy of the validated codes will also be assessed. In addition, PSR and MSSR merge rates will be calculated. Detection statistics for the performance monitoring targets (SRTQCs, Beacon Real-Time Quality Control (BRTQCs), MTI reflector returns, MRSM replies) will also be determined.

4.4.1.8.8 Test Resources.

a. PC with network interface card and NetXRay Lan Sniffer software
b. ARTS-IIE with data extraction facility
c. RBAT
d. IRES
e. Excel

4.4.1.9 Surveillance Detection.

4.4.1.9.1 Purpose.

This test will be performed using a dedicated aircraft of known RCS. The aircraft will fly patterns which will test detection in the clear, detection over clutter, tangential detection, and detection in light precipitation.

4.4.1.9.2 Requirements Verified in This Test.

See appendix A for requirement details
Requirement # - 61, 66, 72, 316, 317, 318, 319, 320, 456, 463, 464, 502, 503, 505, 588, 611, 634, 732.1, 732.5

4.4.1.9.3 Test Objectives.

a. Verify that the ASR-11 provides detection of air carrier, military, air taxi, and general aviation aircraft in ground, weather, and anomalous propagation clutter and output accurate, reliable surveillance (range and azimuth) data to ATC facilities, and provides six-level weather detection.

b. Verify that the PSR processes primary radar targets in the detection volume as defined below:

1. Slant Range: 0.5 - 60 nmi

2. Azimuth: 360°

3. Altitude: 0 - 24,000 feet AGL as limited by the elevation coverage requirement.

4. Elevation: From local radar horizon as determined by earth curvature, atmospheric refraction, and as further limited by terrain screening to 30° with respect to the horizontal plane at the radar antenna.

c. Verify that the PSR detects all aircraft with the following characteristics which are within the detection volume:

1. Radar Cross-Section: 1 to 10,000 square meters (m^2)
2. Ground Speed: 25 to 700 km

d. Verify that, in the clear, the PSR detects a 1 m^2 Swerling 1 target anywhere within the detection volume with a single scan $P_d \geq 0.8$ at a P_{FA} of 10^{-6} over 92 percent of the radial velocities between -700 and +700 kns.

e. Verify that the PSR provides correlated and uncorrelated search reports over the specified detection volume.

f. Verify that the PSR meets coverage requirements with 7 of 8 transmitter modules on-line.

g. Verify seamless PSR detection performance through the short pulse/long pulse transition range and high beam/low beam transition range.

h. Verify that the PSR detects tangentially moving targets within the specified detection limits.

i. Verify that the PSR suppresses combinations of fixed and moving clutter (see applicable parts of the specification clutter table for each test site) while detecting aircraft targets.

j. Verify that the PSR maintains the detection performance through the weather available at the test site.

k. Verify that the PSR detects targets within the specified detection limits when the anomalous propagation filter set is used.

l. Verify that the PSR detects targets within the specified detection limits during periods when pulsed interference conditions exist.

m. Verify that the PSR adaptive plot amplitude thresholding function adequately controls angel activity and does not reduce detection of real targets below specified limits in the areas that they are applied.

n. Verify that the PSR maintains detection performance for targets flying through areas where RAG maps have been set up to control false alarms due to strong clutter or road traffic.

o. Verify that use of primitive zones allows sufficient coverage around sensitive areas (e.g., in the areas of runways).

p. Verify that the PSR tracks targets with velocities from 25 kns through 750 kns throughout the coverage volume.

q. Verify that the MSSR achieves requirements for probability of detection for aircraft equipped with ATCRBS or Mode-S transponders operating over the full range of acceptable limits specified in FAA-Order-1010.51A.

r. Verify that the MSSR processes beacon targets in the detection volume as defined below:

1. Slant Range: 0.5 to 60 nmi or 0.5 to 120 nmi

2. Azimuth: 360°

3. Altitude: 0 to 60,000 feet above ground level as limited by the elevation coverage

4. Elevation: From 0.25° above local radar horizon as determined by earth curvature, atmospheric refraction and as further limited by terrain screening to 40° with respect to the horizontal plane of the radar.

s. Verify that the MSSR Pd exceeds 0.995 minimum for targets in the site environment. (For this test, MSSR Pd will be measured for round reliability of available targets of opportunity and available FRUIT conditions at the test site.)

t. Verify that the MSSR maintains specified detection through known reflection areas.

u. Verify that MSSR codes are validated 95 percent of the time when four or more replies are received per mode.

v. Verify that MSSR codes are correct at least 99 percent of the time in the presence of FRUIT (available in the test site environment).

w. Verify that the MSSR validates incorrect codes due to fruit or other causes less than 1 percent of the time.

x. Verify that the PSR and SSR targets are successfully merged 98 percent of the time.

y. Verify that the ASR-11 consistently outputs the following performance monitoring reports:

1. An internally generated uncorrelated SRTQC message once per scan.

2. A formatted correlated SRTQC message once per scan at the same location as the uncorrelated SRTQC but with a unique ID.

3. Target reports from the MTI reflectors within the detection limits of the PSR.

4. An internally generated BRTQC message once per scan.

5. Target reports from the MRSM within the detection limits of the MSSR.

4.4.1.9.4 Test Location - Stockton.

4.4.1.9.5 Test Configuration.

The ASR-11 will be optimized by the Government prior to this test (see section 4.2.5 "Site Adaptation and Optimization"). This test will be performed with the system operated in its optimized state. Several of the important parameter settings are identified in table 4.4.1.9.5-1.

The detection flights will be performed with the PSR operating in Circular Polarization with seven of eight transmitter modules on-line. These settings present the worst case for signal strength into the receiver for a system that is still certified for use by AT.

The combiner will be disabled during these flights. With the combiner disabled, the PSR and MSSR range and azimuth information will be reported separately (in radar only and beacon only reports, respectively). This will allow for an independent assessment of the PSR and MSSR positional accuracy using GPS as a source of positional truth (see Surveillance Accuracy - section 4.4.1.12).

The Radar Interference Suppressor and the Plot Amplitude Thresholding will be enabled during the flights. Since these features of the radar are designed to control the false alarm rate, their impact on detection will be evaluated.

The need for RAGs at Stockton will be determined during Government optimization of the system. RAGs may be used to establish primitive zones (e.g., in the vicinity of runways) or to change minimum velocity tracker thresholds (e.g., in the vicinity of roads). These settings will remain in their optimized state during the detection flights.

The detection flight tests will be performed with the beacon system configured for 60 nmi operation. The Mode Interlace pattern will most likely be 3/A, C for optimized ASR-11 at Stockton. Beacon reflection processing will be enabled throughout the test.

TABLE 4.4.1.9.5-1. ASR-11 PARAMETER SETTINGS FOR THE DETECTION TEST.

Parameter	Setting	Comments
Polarization	Circular	
Transmitter Modules Online	7/8	
Combiner	Disabled	Combiner disabled to allow for accuracy measurement using both PSR and MSSR reported positions.
Radar Interference Suppressor	Enabled	
Plot Amplitude Thresholding	Enabled	
Range Azimuth Gating	Enabled	Use of range azimuth gates will be dependent on the results of Government optimization of the system.
Primitive Zones	Enabled	Use of primitive zones will be dependent on the results of Government optimization of the system.
Minimum Velocity Tracker thresholds	25 Kts	Government optimization of the system may reveal the need to set up zones where the minimum thresholds are set greater than 25 kts (e.g., over roads)
Instrumented beacon range	60 nmi	
Beacon PRF	TBD	
Beacon Mode Interlace	3/A, C	
Beacon Reflection Processing	Enabled	

The Surveillance Detection test will be performed using dedicated aircraft. RCS information will be obtained for each aircraft and used during data analysis. Each aircraft will be equipped with GPS equipment. The GPS data will be used as a source of positional truth during the Surveillance Accuracy test. Test personnel at the radar site will maintain voice communications with the aircraft throughout the test.

Surveillance data will be recorded at the SCDI, at the output of the SCDI (using NetXRay), at the output of the SDT and at the Common ARTS. The Asterix data (recorded at the SCDI) also includes ASR-11 weather data. In addition, clutter maps and A-scope snapshots will be recorded at the SCDI to capture the state of the environment during the test.

4.4.1.9.6 Test Approach.

Flight tests will be conducted to assess the detection capabilities of the radar. Four different types of scenarios will be flown: (1) radial flights in the clear, (2) flights over clutter, (3) orbital flights in the clear, and (4) flights through low level weather. Specifics of scenarios (e.g., on which azimuth to fly radials) to be flown will be identified only after coordination with local AT

representatives at Stockton and after review of site clutter maps. Low altitude detection flights will be performed using a small radar cross section aircraft (e.g., a Cessna-150) rented in the locality of the Stockton site. Higher altitude flights will be performed using a Beech King Air.

Prior to execution of each flight test, clutter maps will be recorded at the SCDI and analyzed to determine clutter levels along the flight route. Clutter map snapshots will also be recorded periodically during the flights to maintain information regarding changing clutter conditions. A-scope snapshots will also be taken during the flights to determine the signal to noise ratio for the test aircraft as a function of range and to identify any interference along the test radials.

Radial flights in the clear will be conducted to measure the vertical coverage capabilities of the radar. The aircraft will fly outbound radially from the antenna to a range where detection is lost. The aircraft will then turn around and fly inbound at the same altitude crossing the antenna. This inbound/outbound leg will be repeated three times at each altitude. These radials will be flown at altitudes from 1000 to 10,000 feet in 1000-foot (ft) increments and at 15,000 feet, 20,000 feet and 24,000 feet.

Flights over clutter will be conducted to determine the ability of the optimized ASR-11 to discriminate between moving targets and clutter. The smaller RCS aircraft will fly at low altitude through areas of clutter as identified by the ASR-11 clutter maps and local road maps. Areas where rag maps have been set up for control of road traffic or strong clutter will be of particular interest when choosing flight routes.

The smaller aircraft will fly an orbital path at 10 nmi in the clear for assessment of the ASR-11 tangential detection capabilities. For the purpose of this test, "in the clear" is defined as the absence of strong clutter in the local radar environment. Clutter foldover effects internal to the ASR-11 will not be considered local radar environment clutter.

Target detection in weather will be measured through dedicated radial flights through light precipitation. The conduct of these flights will be left up to the discretion of the pilots and local AT personnel. If flying through weather is deemed too risky for the small aircraft, then targets of opportunity through weather (presumably with larger aircraft) will be substituted for these flights.

4.4.1.9.7 Data Analysis Methods.

Data reduction and analysis for the detection tests will be performed using RBAT and IRES. Data will be filtered to separate legs flown at different altitudes. Inbound and outbound portions of the legs will be analyzed separately to account for differences in radar cross sections. Radar and beacon blip scan percentages for the test aircraft will then be calculated. The number of radar (or beacon) reports will be counted and divided by the total number of opportunities (i.e., the number of scans that the aircraft was flying along the routes).

The results will be presented in the form of radar and beacon detection histograms for each altitude. The inner and outer ranges at which detection falls below 80 percent will be noted on the plots. Any apparent holes in detection will be investigated through inspection of the recorded

clutter maps, RAG maps, plot amplitude threshold activity, and areas of beacon reflectors. The minimum and maximum detection ranges achieved will be compared to theoretical values.

Target of Opportunity data recorded during the dedicated flights will also be analyzed for detection and false alarm performance.

4.4.1.9.8 Test Resources.

a. Test Aircraft of known Radar Cross Section (2) with GPS equipment installed
b. PC with network interface card and NetXRay Lan Sniffer software
c. 1 Communications transceiver with antenna
d. 1 VHF communications frequency
e. 1 ARTS-IIE with data extraction facility
f. RBAT
g. IRES
h. Excel

4.4.1.10 Surveillance False Alarm Rate.
4.4.1.10.1 Purpose.

Verify that the surveillance false alarm rate is operationally acceptable for use in terminal ATC.

4.4.1.10.2 Requirements Verified in This Test.

See Appendix A for requirement details
Requirement # - 318 - 320, 329, 334, 462, 217, 528, 567, 588, 596, 597, 598, 600, 601

4.4.1.10.3 Test Objectives.

a. Verify that the PSR reports targets prior to scan-to-scan correlation with a maximum of 100 false search reports per scan in three consecutive scans in normal and excessive clutter conditions.

b. Verify that the ASR-11 reports no more than one false PSR track report per scan averaged over 15 minutes under normal clutter conditions.

c. Verify that the ASR-11 reports no more than 10 false PSR track reports per scan averaged over 10 scans when the clutter environment exceeds normal conditions.

d. Verify that the ASR-11 provides false target processing to minimize false target declarations from clutter types including ground, weather, road and surface traffic, birds, second time around clutter, second time around targets, interference, sea and AP clutter.

e. Verify that the ASR-11 adaptive features for controlling false alarms are effective in reducing false alarms while maintaining Pd.

f. Verify that the AP filter set is effective in eliminating false alarms due to anomalous propagation returns.

g. Verify that the MSSR reports no more than one false target report per scan when averaged over 15 minutes in the site FRUIT environment.

h. Verify that the MSSR generates no more than one split target per scan when averaged over 15 minutes. This includes single aircraft beacon's discrete Mode 2 and Mode 3 replies and nondiscrete replies.

i. Verify that the MSSR reports no more than one false target report per scan averaged over 15 minutes due to reflections of the mainbeam caused by permanent or temporary reflecting objects.

j. Verify that the single scan probability of a split report is less than 0.75 percent for targets having a SNR greater than or equal to 20 dB.

k. Verify that high-altitude, short-range reports (from ring around targets) not associating with a track are compared with existing tracks and deleted if the range and codes are found to match.

4.4.1.10.4 Test Location.

Stockton and Eglin.

4.4.1.10.5 Test Configuration.

The false alarm analysis will be performed on data collected during the dedicated coverage and resolution flight tests and the target of opportunity tests. ASTERIX data (plot, track, and weather data streams) will be recorded using a personal computer (PC) equipped with a network interface card (connected at a hub in the communications cabinet) and NetXRay Lan sniffer software. Surveillance data will also be recorded using the ARTS-IIE data extraction subsystem.

The radar will be operated in different modes during various data collections. The system configuration will be noted in the system log book prior to each test. Data will be recorded while the system is operating in linear polarization, circular polarization, with the combiner on/off, with 8/8 transmitter modules on-line, with 7/8 transmitter modules on-line, with the RIS on/off, with range azimuth gates enabled/disabled, with the normal filter sets enabled, and with the AP filter sets enabled.

4.4.1.10.6 Test Approach.

Data from each flight test (section 4.2 "Surveillance Detection" and section 4.4 "Surveillance Resolution") and targets of opportunity will be analyzed to verify the false alarm requirements.

These same data sets will also be analyzed for radar and beacon Pd to ensure that the Pd and false alarm requirements are simultaneously met.

The data sets will be recorded in as many different environmental conditions as are available at the test sites. Data will be recorded in available weather, anomalous propagation, and RF interference. ASR-11 false alarm control mechanisms (e.g., plot amplitude thresholding, the radar interference suppressor, and beacon reflection processing) will also be evaluated to ensure that these features are effective in limiting the number of false alarms while not adversely effecting the probability of detection.

4.4.1.10.7 Data Analysis Methods.

Data recorded during the Surveillance Detection tests and target of opportunity runs will be analyzed to ensure that the PSR and MSSR false alarm rates are within specification limits. Data recorded at each point in the system will be analyzed using RBAT and IRES to ensure that the false alarm requirements are met for the end-to-end system.

Detection and false alarm rates will be evaluated for the same data sets. Performance through areas of clutter, interference, weather, and anomalous propagation will be assessed. The location and strength of the clutter will be identified using the clutter maps recorded during the test. The location and strength of interference will be identified using the A-scope snapshots recorded during the test. The location and intensity of the weather will be identified using the recorded ASR-11 weather maps. The presence of anomalous propagation will be verified through inspection of the ASR-7 displays and NEXRAD information, if available.

Data will be analyzed separately for the plot and track data streams. The data will be tracked to separate real from potentially false reports. Real tracks will be distinguished from false tracks using characteristics such as minimum track life, percent of the radar beacon merged reports in the track, and minimum track speed. Potentially false reports will be further studied to determine the likely cause of the false report.

The effectiveness of the PSR and MSSR trackers will also be evaluated by filtering the data using the Raytheon track numbers. Crossing tracks, tracks over areas of known clutter and roads, and tracks through areas of known beacon reflections will be studied to ensure correct operation of the ASR-11 trackers.

The data will also be analyzed to ensure that the ASR-11 false alarm control mechanisms do not degrade detection performance.

a. PSR detection performance will be measured with the RIS enabled.

b. PSR detection performance will be measured in areas where plot amplitude thresholding is active. The times and locations of the plot amplitude thresholding will be determined through observations during the data recording.

c. PSR detection performance will be measured in areas where RAG zones have been set up (e.g., over roads or in areas of strong clutter).

d. Beacon detection performance will also be measured for aircraft flying through areas of known beacon reflectors. Recorded permanent and dynamic reflector files will identify the locations and orientations of the reflecting surfaces.

In addition to determining the overall false plot and false track counts per scan, the location of the false alarms will be studied. High concentration of false alarms in a critical area (such as an approach) may be an operational problem for AT, even if the overall number of false reports per scan is within specification limits.

4.4.1.10.8 Test Resources.

a. NetXray
b. PC with network interface card and NetXRay Lan Sniffer software
c. RBAT
d. IRES
e. Excel

4.4.1.11 Surveillance Resolution.

4.4.1.11.1 Purpose.

This test will verify that the radar resolution is sufficient to enable positive separation using existing AT procedures.

4.4.1.11.2 Requirements Verified in This Test.

See appendix A for Requirements Details
Requirement # - 332, 333, 487, 489, 490

4.4.1.11.3 Test Objectives.

a. Verify that, when returns are detected from two Swerling 1 targets, separated in range by at least 0.125 nmi, on the same azimuth, with the same or different radial velocities, and located at any point in the coverage volume, the PSR resolves the two targets and generates two unique target reports 80 percent of the time for any combination of RCS from 1 to 20 m^2 provided that the larger target's RCS is not more than 8 dB greater than the smaller target's RCS.

b. Verify that, when returns are detected from two Swerling 1 targets, separated in azimuth by 2.8°, at the same range, with the same or different radial velocities and located at any point in the coverage volume, the PSR resolves the two targets and generates two unique target reports 80 percent of the time for any combination of RCS from 1 to 20 m^2 provided that the larger target's RCS is not more than 8 dB greater than the smaller target's RCS.

c. Verify that, at least 95 percent of the time, the MSSR resolves two noninterfering targets with the same center azimuth if they are separated in slant range by 0.05 to 0.5 nmi inclusive (assuming identical transponder delays).

d. Verify that the MSSR resolves the targets at least 99.9 percent of the time when they are separated by more than 0.5 nmi.

e. Verify that the MSSR resolves two targets (which have different Mode 3/A codes) at least 99 percent of the time when they are within 0.05 nmi of each other in slant range and are separated by 1.5°.

4.4.1.11.4 Test Location.

Stockton

4.4.1.11.5 Test Configuration.

The resolution test will be performed on a Government optimized ASR-11 operating in linear polarization with eight transmitters on-line. Data recorded during this test will also be used in the assessment of positional accuracy (see section 4.4.1.12). Therefore, the radar and beacon combiner function in the ASR-11 will be disabled to allow for separate assessment of PSR and MSSR reported accuracy.

Four different types of data will be recorded during the flight tests.

a. GPS raw latitude, longitude, altitude, and time will be recorded on each aircraft. A GPS receiver (type Ashtech Z-12), a GPS antenna, and a laptop PC with external ZIP drive (for recording the GPS data) will be installed on each aircraft.

b. A GPS base station receiver (also type Ashtech Z-12) will be located in the Government trailer interfaced to a desktop PC. The choke ring antenna for the base station will be mounted at an independently surveyed point.

c. An ASTERIX data recording PC equipped with a network interface card and NetXRay Lan sniffer software will be located in the radar shelter (connected at a hub in the communications cabinet). Surveillance data will also be recorded using the ARTS-IIE data extraction subsystem.

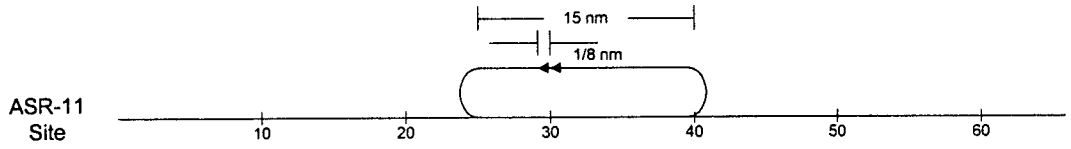
d. A separate PC, also located in the radar shelter, will be dedicated to recording and time stamping ACPs. This PC will be equipped with a TrueTime GPS card and a ACP record card. The GPS card interfaces to its own antenna, mounted outside the shelter.

4.4.1.11.6 Test Approach.

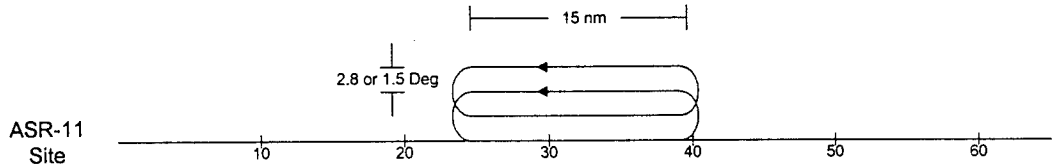
Two GPS equipped aircraft of different radar cross section (within 8 dB of each other) will fly in close range and azimuth proximity during this test. The aircraft will fly three different types of scenarios: (1) a range resolution scenario, (2) an azimuth resolution scenario, and (3) a scenario consisting of crossing and diverging tracks. Both primary and secondary radar resolution performance will be evaluated during this test. Note that the beacon resolution tests will be supplemented with data recorded during ARIES tests (described in section 4.4.1.13, MSSR Performance).

The range resolution scenario will consist of flying the two aircraft in a single holding pattern between 25 and 40 nmi from the radar (see figure 4.4.1.11-1). The holding pattern will be a racetrack shaped pattern with one of its legs positioned along a radial to the radar. The lead aircraft will fly at constant speed in the pattern. The trail aircraft will follow the lead aircraft along the same azimuth at a slightly different altitude. At the direction of personnel at the radar site, the trail aircraft will repeatedly overtake, then fall behind the lead aircraft in order to maximize range resolution samples. The range resolution scenario will also include several radial legs where the aircraft are separated nominally by 1/8 nmi (not shown in the figure). These radial legs will cross the short pulse/long pulse transition range and the beam switch range.

The azimuth resolution scenarios will consist of flying the two aircraft in separate, parallel racetrack patterns between 25 and 40 nmi from the radar (see figure 4.4.1.11-1). One aircraft will fly at constant speed in its pattern. The second aircraft, with direction from personnel at the radar site, will adjust its speed, as needed, to ensure that the two aircraft maximize their time at the same range from the radar. Two different azimuth resolution scenarios will be flown. During the PSR resolution scenario, the aircraft will be separated in azimuth by 2.8°. During the MSSR resolution, the aircraft will be separated by 1.5°.



Range Resolution Scenario



Azimuth Resolution Scenario

FIGURE 4.4.1.11-1. RESOLUTION FLIGHT SCENARIOS

The crossing track scenarios will consist of the two targets crossing each other at predefined ranges from the radar. The aircraft will fly at an altitude separation that is comfortable for the pilots. The diverging track scenarios will consist of the two targets approaching each other and then turning away from each other before their paths intersect.

During each of the flight tests, the aircraft will be GPS equipped. Each aircraft will contain an Ashtech Z-12 GPS receiver and GPS antenna. The Ashtech Z-12 positional accuracy is specified to be within 80 centimeters (cm) 95 percent SEP. This accuracy is two orders of magnitude better than the specified ASR-11 accuracy. The receiver will log GPS position and time data to a portable PC on the aircraft for the duration of the flight.

Data will also be recorded at a GPS base station, located at an independently surveyed location near the radar site. The base station data will be used to differentially correct the GPS data recorded on each aircraft (to account for inherent errors in the GPS system due to atmospheric conditions, satellite clock drift, etc). The differential corrections will be applied to the positions during post-test analysis of the data.

Surveillance data will be recorded at the output of the ASR-11 local SCDI and at the Common ARTS during the test. NetXRay will also monitor the performance of the ASR-11 ethernet LAN and log any anomalies during the test. In addition, surveillance data will be recorded using the ARTS-IIE data extraction facility.

ACP data will be recorded from a RS-530 serial data line from the MSSR cabinet. Each recorded ACP will be time stamped with a GPS time and stored to disk during the test. This data will be used to correct the time stamps on the recorded Asterix data for the flight test aircraft. The correction will take place during post-test analysis of the data. This step is necessary to remove the effects of system throughput delay on the accuracy assessment (i.e., the GPS reported positions must be correlated to the ASR-11 reports based on the time that the antenna boresight was in the direction of the aircraft; otherwise, a bias will be introduced into the results).

4.4.1.11.7 Data Analysis Methods.

Resolution analysis will be performed on the flight test data using the GPS reported positions as truth. Percent resolution will be computed based on the GPS reported separation between the two aircraft and the existence of one (no resolution) or two (targets resolved) radar reports.

The following steps will be performed to analyze the data.

First, differential corrections will be generated using Ashtech proprietary PNAV (Precision Navigation) software. The corrections will be made based on a comparison of the GPS position (recorded using the base station receiver) with the known, surveyed location of the base station antenna. The corrections will include errors common to all components of the GPS system (e.g., satellite clock errors, ephemeris errors, etc).

Next, the differential corrections will be applied to each aircraft GPS data set using the PNAV software. This process will remove the common errors from the data.

Each of the differentially corrected aircraft data sets will then be translated from Latitude/Longitude/Altitude coordinates to Range/Azimuth/Height (i.e., rho-theta) coordinates. The center of the new coordinate system will be the ASR-11 antenna location. This transformation is performed to allow comparison of the GPS and surveillance data sets (in the same coordinate system).

The surveillance data will be reformatted into IRES PCS-2 format. The time will be corrected for the offset between Pacific Standard Time and Universal Coordinated Time (8-hour time difference). The data will then be filtered to isolate reports from the test aircraft. The surveillance reports will then be updated with time from the ACP time-stamped data.

GPS positional data from the aircraft will then be converted to PCS-2 format and merged with the surveillance data in the same file. Since the GPS data has a 1-second update rate and the radar has a 4.8-second update rate, GPS truth positions will be determined through a linear interpolation process between adjacent samples.

The resolution analysis will then be performed through comparison of GPS reported separations for the two aircraft and the presence of one (targets not resolved) or two (targets resolved) surveillance reports. Percent resolution will calculated by dividing the number of times the radar resolved the closely spaced aircraft (i.e., two target reports output) by the number of

opportunities. Results will be presented in a histogram format for the PSR range resolution, PSR azimuth resolution, MSSR range resolution, and MSSR azimuth resolution. The specification limits will be noted on each plot.

The data will also be analyzed to ensure that the PSR and MSSR split rate requirements are being met, and that there are no beacon code swaps. Beacon codes will also be inspected for accuracy and validation during the MSSR resolution analysis.

4.4.1.11.8 Test Resources.

a. Test Aircraft (2)
b. Ashtech Z-12 GPS Receivers (one for each aircraft)
c. Ashtech Z-12 Base Station Receiver with Choke Ring Antenna
d. Ashtech PNAV Software
e. Laptop PCs (one on each test aircraft)
f. PC with network interface card and NetXRay Lan Sniffer software
g. PC with TrueTime GPS card and ACP record card
h. 1 Communications transceiver with antenna
i. 1 VHF communications frequency
j. 1 ARTS IIE with data extraction facility
k. IRES
l. RBAT
m. Excel

4.4.1.12 Surveillance Accuracy.

4.4.1.12.1 Purpose.

This test will verify that the ASR-11's positional accuracy is sufficient for operational use.

4.4.1.12.2 Requirement Verified in This Test.

See appendix A for Requirements Details
Requirement # - 330, 331, 465, 466

4.4.1.12.3 Test Objectives.

a. Verify that for an aircraft target with a signal-to-noise ratio (SNR) greater than or equal to 30 dB, including processing gain, the range error of the ASR-11 PSR does not exceed 275 feet root mean square (rms), including bias.

b. Verify that for an aircraft target with SNR greater than or equal to 30 dB, including processing gain, and at elevation angles between 1° to 20° with respect to the horizontal plane at the radar site, the PSR azimuth error does not exceed 0.16° rms, including bias.

c. Verify that the MSSR range error is no greater than 190 feet rms with transponder error (including bias) at any point in the detection volume.

d. Verify that with MSSR round reliability of 0.75, and all modes responding, the azimuth error is no greater than 0.08° rms, including bias.

e. Verify that the radar, beacon range, and azimuth extents of the reconstituted video slashes output from the DVGs are set properly (i.e., to ensure that the target position is always contained within the slash).

4.4.1.12.4 Test Location.

Stockton

4.4.1.12.5 Test Configuration.

This test will be performed on a government-optimized ASR-11. For dedicated flight tests, the radar and beacon combiner function will be disabled to allow for separate assessment of PSR and MSSR reported accuracy.

Four different types of data will be recorded during the flight tests for use in the accuracy analysis.

a. GPS raw latitude, longitude, altitude, and time will be recorded on each aircraft. A GPS receiver (type Ashtech Z-12), a GPS antenna, and a laptop PC with external ZIP drive (for recording the GPS data) will be installed on each aircraft.

b. A GPS base station receiver (also type Ashtech Z-12) will be located in the government trailer interfaced to a desktop PC. The choke ring antenna for the base station will be mounted at an independently surveyed point.

c. An ASTERIX data recording PC equipped with a network interface card and NetXRay Lan sniffer software will be located in the radar shelter (connected at a hub in the communications cabinet). Surveillance data will also be recorded in the Common ARTS data extraction system.

d. A separate PC, also located in the radar shelter, will be dedicated to recording and time stamping ACPs. This PC will be equipped with a TrueTime GPS card and a ACP record card. The GPS card interfaces to its own antenna, mounted outside the shelter.

4.4.1.12.6 Test Approach.

The PSR and MSSR range and azimuth accuracy will be assessed through analysis of data from three different sources.

a. An assessment of the accuracy will be made through a comparison of the reported position for the MRSM with its known surveyed position. This analysis will be performed on data from flight tests and targets of opportunity.

b. A 9-point polynomial curve fit program in RBAT will be used to determine range and azimuth deviation on "straight flying" target of opportunity tracks.

c. An independent positional source of truth, GPS will be used during the dedicated flight tests. ASR-11 reported positions will be compared to the GPS reported positions for each aircraft.

During each of the flight tests, the aircraft will be GPS equipped. Each aircraft will contain an Ashtech Z-12 GPS receiver and GPS antenna. The Ashtech Z-12 positional accuracy is specified to be within 80 cm 95 percent SEP. This accuracy is two orders of magnitude better than the specified ASR-11 accuracy. The receiver will log GPS position and time data to a portable PC on the aircraft for the duration of the flight.

Data will also be recorded at a GPS base station, located at an independently surveyed location near the radar site. The base station data will be used to differentially correct the GPS data recorded on each aircraft (to account for inherent errors in the GPS system due to atmospheric conditions, satellite clock drift, etc.) The differential corrections will be applied to the positions during post-test analysis of the data.

Surveillance data will be recorded at the output of the ASR-11 local SCDI and at the Common ARTS during the test. NetXRay will also monitor the performance of the ASR-11 ethernet LAN and log any anomalies during the test.

ACP data will be recorded from a RS-530 serial data line connected to the MSSR cabinet. Each recorded ACP will be time stamped with a GPS time and stored to disk during the test. This data will be used to correct the time stamps on the recorded Asterix data for the flight test aircraft. The correction will take place during post-test analysis of the data. This step is necessary to remove the effects of system throughput delay on the accuracy assessment (i.e., the GPS reported positions must be correlated to the ASR-11 reports based on the time that the antenna boresight was in the direction of the aircraft. Otherwise, a bias will be introduced into the results).

After the positional accuracy of the ASR-11 is determined, the SDT VSPs will be inspected to ensure that the range and azimuth extents for the reconstituted radar and beacon slashes are set properly. These VSPs should be configured to ensure that the aircraft always falls within the limits of the slash.

4.4.1.12.7 Data Analysis Methods.

Analysis of the MRSM accuracy data will be performed using IRES and Excel. The recorded surveillance data (Asterix or Common ARTS format) will first be converted to IRES PCS-2 format. The data will then be filtered to extract the MRSM reports from the file. This data will

then be imported into an Excel spreadsheet where the reported range and azimuth for the MRSM will be compared with the surveyed location.

Data from targets of opportunity will be analyzed using the RBAT Nine Point program to verify the reporting accuracy of the PSR and MSSR. Nine Point fits a curve to each track. The range and azimuth for each point on the curve is a smoothed estimate based on a 9-point sliding window centered on the point of interest. The range and azimuth outliers from the fitted curve are compared to a default limit set in the program. Reports with range and azimuth offsets that exceed the limit are examined more closely. This program can be used to detect any track stitching effects caused by clutter breakthrough or multipath and can be used to ensure that the MSSR accuracy is maintained even at longer ranges (i.e., when the interrogator operates in sliding window mode).

Accuracy analysis will also be performed on the flight test data using the GPS reported positions as truth. Comparison of the range and azimuth offsets of the ASR-11 reports from the GPS truth will indicate the accuracy of the PSR and MSSR.

The following steps will be performed to analyze the data.

First, differential corrections will be generated using Ashtech proprietary PNAV software. The corrections will be made based on a comparison of the GPS position (recorded using the base station receiver) with the known, surveyed location of the base station antenna. The corrections will include errors common to all components of the GPS system (e.g., satellite clock errors, ephemeris errors, etc.)

Next, the differential corrections will be applied to each aircraft GPS data set using the PNAV software. This process will remove the common errors from the data.

Each of the differentially corrected aircraft data sets will then be translated from Latitude/Longitude/Altitude coordinates to Range/Azimuth/Height (i.e., rho-theta) coordinates. The center of the new coordinate system will be the ASR-11 antenna location. This transformation is performed to allow comparison of the GPS and surveillance data sets (in the same coordinate system).

The surveillance data will be reformatted into IRES PCS-2 format. The time will be corrected for the Pacific Standard Time/Universal Coordinate Time offset. The data will then be filtered to isolate reports from the test aircraft. The surveillance reports will then be updated with time from the ACP time stamped data.

GPS positional data from the aircraft will then be converted to PCS-2 format and merged with the surveillance data in the same file. The accuracy analysis will then be performed through comparison of GPS reported positions and ASTERIX reported positions. Since the GPS data has a 1-second update rate and the radar has a 4.8-second update rate, GPS truth positions will be determined through a linear interpolation process between adjacent samples.

Separate plots of the data will be produced for the PSR range accuracy, PSR azimuth accuracy, MSSR range accuracy, and MSSR azimuth accuracy. The specification limits will be noted on each plot.

4.4.1.12.8 Test Resources.

a. Test Aircraft (2)
b. Ashtech Z-12 GPS Receivers (one for each aircraft)
c. Ashtech Z-12 Base Station Receiver with Choke Ring Antenna
d. Ashtech PNAV Software
e. Laptop PCs (one on each test aircraft)
f. PC with network interface card and NetXRay Lan Sniffer software
g. PC with TrueTime GPS card and ACP record card
h. IRES
i. RBAT
j. Excel

4.4.1.13 MSSR Performance.

The tests described in this section are designed to evaluate the effectiveness of the ASR-11 MSSR interrogator in detecting and processing replies from transponder equipped aircraft. The ARIES will be used to stress the interrogator. Scenarios designed to test the detection, false alarm rate, accuracy, resolution, code validation and accuracy, and emergency target processing capabilities of the interrogator will be injected into the sum and difference channels of the interrogator at RF. Data will be recorded at the output of the ASR-11 and at the ARTS-IIE and analyzed to verify correct performance of the system.

The ARIES tests will complement the "live" tests (dedicated flights and targets of opportunity) which are described in other sections of this plan. The "live" tests provide data in real-world conditions, where antenna effects and environmental conditions can influence the performance of the beacon extractor. These effects are not fully simulated by ARIES.

4.4.1.13.1 Purpose.

Ensure that the MSSR accurately and effectively processes replies from transponder equipped aircraft.

4.4.1.13.2 Requirements Verified in This Test.

See appendix A for Requirements Details
Requirement # - 455-459, 461-466, 487, 489, 490, 492, 502, 503, 505, 596-598, 600, 601, 610.

4.4.1.13.3 Test Objectives.

a. Verify that the MSSR complies with ATCRBS ground equipment requirements of FAA Order 1010.51A (for Modes 2, 3/A, and C) and ICAO Annex 10 and is fully compatible with the other ATCRBS elements described in these documents.

b. Verify that the MSSR meets all requirements for a broad selection of PRFs to allow government allocation of PRFs at all sites according to the requirements of FAA Order 6050.32 paragraph 1302.

c. Verify that the MSSR P_d is 0.995 minimum for targets with a round reliability of 0.75 with three-fourths of the modes responding, in a steady state condition of 10,000 ATCRBS and 200 Mode S FRUIT per second, of which 30 percent are in the main beam.

d. Verify that the MSSR reports no more than one false target report per scan when averaged over 15 minutes in the steady-state FRUIT condition of 10,000 ATCRBS and 200 Mode S FRUIT per second of which 30 percent are in the main beam.

e. Verify that the MSSR generates no more than one split target per scan when averaged over 15 minutes, this includes single aircraft beacon's discrete Mode 2 and Mode 3 replies and nondiscrete replies.

f. Verify that the ASR-11 MSSR interrogator recognizes the false "phantom" brackets which can occur in the closely spaced reply condition when nonframing pulses in different replies occur at the framing interval.

g. Verify that the MSSR generates no more than one false report per scan averaged over 15 minutes due to reflections of the mainbeam caused by permanent or temporary reflecting objects.

h. Verify that the MSSR range error is ≤190 feet RMS with transponder error (includes bias) at any point in the detection volume.

i. Verify that, with MSSR round reliability of 0.75, and all modes responding, the azimuth error is no greater than 0.08° RMS, including bias.

j. Verify that, at least 95 percent of the time, the MSSR resolves two detected, stationary and identical, noninterfering targets with the same center azimuth if they are separated in slant range by 0.05 to 0.5 nmi inclusive (assuming identical transponder delays) when the ranges of both targets are between the minimum and maximum range limits.

k. Verify that the MSSR resolves targets at least 99.9 percent of the time when they are separated by more than 0.5 nmi.

l. Verify that with identical transponder delays, the MSSR resolves two detected identical targets that are within 0.05 nmi of each other in slant range and which are separated by 2.1° at least 95 percent of the time and resolves two targets that are within 0.05 nmi of each other in slant range and have at least one distinguishing characteristic and are separated by 1.5° at least 99 percent of the time.

m. Verify that the MSSR codes are validated 95 percent of the time when four or more replies are received per mode.

n. Verify that MSSR code validations are correct at least 99 percent of the time in the presence of FRUIT as specified in specification paragraph 3.2.2.4.

o. Verify that the MSSR validates incorrect codes due to FRUIT or other causes less than 1 percent of the time.

p. Verify that the interrogator correctly processes and reports civilian and military emergency replies.

q. Ascertain the effects of an overload condition on the interrogator.

4.4.1.13.4 Test Location.

Stockton

4.4.1.13.5 Test Configuration.

The MSSR parameters will be optimized by the Government prior to execution of this test and for the most part will remain unchanged for the duration of the test. One exception is the beacon PRF which will be 200 Hz for some of the tests and will be changed to 375 Hz for other tests. The mode interlace pattern will be 3/A, 2, C for most tests. Exceptions will be noted.

ARIES is a monopulse test set capable of injecting beacon replies and fruit at RF into the sum and difference channels of the interrogator. ARIES connects to the interrogator at the J27 (Sum), J28 (Control), and J29 (Difference). ARIES injects replies in response to MSSR interrogations.

Data will be recorded at three different locations during the scenario injection: ARIES data extraction, NetXRay lan sniffer, and ARTS-IIE data extraction.

ARIES reply data will be recorded on a digital audio tape using the data extraction function within ARIES. The reply data will include the range, azimuth, and altitude information on replies generated during each pulse repetition period (prp). This extracted data shows exactly what ARIES injected into the interrogator during the scenario playback. This data will be used to investigate any anomalies experienced during the test.

ASR-11 surveillance data will be recorded from the ethernet lan at the output of the SCDI using a NetXRay lan sniffer. NetXRay will record MSSR track data and status for further analysis during the test.

ARTS-IIE data will also be recorded during the scenario playback. This data will be analyzed to verify the correct end-to-end performance of the ASR-11 when interfaced with the ARTS-IIE.

4.4.1.13.6 Test Approach.

The MSSR performance will be evaluated through analysis of data collected while scenarios are injected into the interrogator. Specific areas to be addressed in the evaluation include detection, false reports, range and azimuth accuracy, range and azimuth resolution, emergency reply processing, and code validation and code accuracy (including assessments of the garble and phantom processing). Table 4.4.1.13.6-1 identifies the type of data to be analyzed for each objective.

TABLE 4.4.1.13.6-1. ARIES SCENARIO DESCRIPTIONS

Scenario Name	Description	Test Objectives Verified (4.4.1.13.3)
DASR12E1	Capacity scenario with 2/3 of the modes responding, 700 targets with 100 false targets per scan (due to reflections), 75% reply probability. Scan, quadrant, sector and wedge capacity. Also 38 dynamically moving targets (crossing tracks, changing codes, etc). 3G and 1G maneuvering targets. To be run with maximum fruit load (DASR12E4).	a, b, c, d, e, f, g, m, n, o
DASR12E2	Capacity scenario with 100% of the targets replying to Mode 3/A interrogations, 90% of the targets replying to Mode C interrogations, and 30% of the targets replying to Mode 2 interrogations. This reply distribution is closer to expected reply distributions in the real world than the DASR12E1 distribution. 700 targets with 100 false targets per scan (due to reflections), 75% reply probability. Scan, quadrant, sector and wedge capacity. Also 38 dynamically moving targets (crossing tracks, changing codes, etc). 3G and 1G maneuvering targets. To be run with maximum fruit load (DASR12E4).	a, b, c, d, e, f, g, m, n, o

TABLE 4.4.1.13.6-1. ARIES SCENARIO DESCRIPTIONS (CONTINUED)

Scenario Name	Description	Test Objectives Verified (4.4.1.13.3)
DASR12E3	Capacity scenario with all targets responding to each mode of interrogation, 700 targets with 100 false targets per scan (due to reflections), 100% reply probability. Scan, quadrant, sector and wedge capacity. Also 38 dynamically moving targets (crossing tracks, changing codes, etc). 3G and 1G maneuvering targets. The target reply power levels are decreased to exercise the sliding window operation of the interrogator during the accuracy tests. To be run with maximum fruit load (DASR12E4).	h, i
DASR12E4	A maximum load of fruit only. (10K ATCRBS and 200 Mode S with 30% of the fruit in the mainbeam.)	d
DASR12E5	This scenario was created from data recorded from the ASR-9 located at Los Angeles International Airport. The data was recorded with the IISLS turned off on the radar. In addition to the reflections found in the data file, false targets simulating returns from additional reflectors are injected into the MSSR, bringing the total number of reflectors to 50 permanent and 50 temporary.	e, g
DASR12E6	Twelve target pairs in the vicinity of 30 nm with each pair separated by 30 degrees. Six of the target pairs are stationary, separated by 1.5 degrees. The targets in these pairs are identical except for one distinguishing characteristic (i.e. Mode 3/A code or Mode C altitude). The remaining pairs contain identical targets with one stationary while the second moves tangentially from 3.15 degrees below the stationary target azimuth to 3.1 degrees beyond the stationary target azimuth. The ranges of the targets differ by no more than 0.05 nm.	E,l
DASR12E7	Three spirals of stationary targets as well as moving targets whose reply pulses overlap or interleave those of the stationary targets. The moving targets start at 0, 90, 180 and 270 degrees and proceed in a clockwise direction for the duration of the file.	j, k, l, m, n, o

TABLE 4.4.1.13.6-1. ARIES SCENARIO DESCRIPTIONS (CONTINUED)

Scenario Name	Description	Test Objectives Verified (4.4.1.13.3)
DASR12E8	Similar to DASR12E7 except that replies from the spiraling targets are now in close proximity to the pulses from the moving targets with no interleave or overlap. This scenario is used to verify correct processing of closely spaced replies (e.g. phantom cases).	j, k, l, m, n, o
Emergency	Three civilian emergency coded targets as well as three military emergency coded targets are injected. Test targets with each of the civilian emergency Mode 3/A codes (7500, 7600, 7700) will be injected. A military transponder sends four replies in succession to denote an emergency. The F1 bracket pulse of each of the three trailing replies is positioned in the SPI position of the preceding reply.	p
Overload	Maximum number of targets (1024 per scan) will be input into the MSSR. The target reply probability will be 100%. This scenario will also have a full load (10K ATCRBS/200 Mode S) fruit.	q
Range Resolution	Six target pairs of equal signal strength. One target of each pair will be stationary. The second target will move radially toward the radar at a very slow rate (~ 1 clock period per scan). The azimuth separation between targets in a pair will 0, .2, .4, .6, .8, and 1 degrees for successive pairs.	e, j, k
Ground Bounce	Targets separated in range by a small amount to simulate a multipath condition. The far range target of each pair will have a reduced signal strength relative to the near range target.	j, k
Ring Around	Targets close to the radar and high in altitude with the same Mode 3/A code will be injected during this scenario.	d

4.4.1.13.7 Data Analysis Methods.

ARIES reply data will be analyzed only when problems need to be investigated. ARIES data reduction tools provide listings for the reply data (which includes range, azimuth, codes, and amplitudes of each reply) injected into the interrogator during each prp. These text files can be imported into an Excel spreadsheet for further analysis.

Surveillance data recorded with NetXRay will be converted from Asterix format to CD-2 or PCS-2 format for use with the RBAT and IRES analysis tools.

ARTS-IIE data will be converted to IRES PCS-2 format. This data will be compared to the data recorded at the SCDI output to ensure that the SDT and ARTS-IIE properly process the beacon reports. Beacon false alarm analysis will be performed on data from dedicated flights, targets of opportunity, and test targets. The data out of the MSSR will be analyzed for splits, multipath, and ringaround.

Digitally recorded data will be analyzed utilizing IRES analysis software. Standard analyses will be performed on all target of opportunity and dedicated flight data sets. The analyses will include calculation of radar reinforcement rates, split rates, zero code percentages, negative altitudes, and Mode 3A and C validation percentages. The MSSR beacon performance will be compared to the ARTS-II beacon performance and to existing certification thresholds.

Code validation and code accuracy performance of the MSSR and ARTS-II and ARTS-III processors will be evaluated through the analysis of targets of opportunity and injected test targets. The test target scenarios will include phantom cases. The phantom cases will consist of bracket pulses of one target replies aligned with the C2 and SPI pulses of the second target's reply.

4.4.1.13.8 Test Resources.

a. Optimized ASR-11 MSSR
b. ARIES
c. PC Equipped with a Network Interface Card and NetXRay Lan Sniffer Software
d. ARTS-IIE with data extraction capability
e. IRES
f. RBAT

4.4.1.14 Surveillance Capacity and Delay.

4.4.1.14.1 Purpose.

Ensure that the ASR-11 can adequately process a capacity target load within specified delay times.

4.4.1.14.2 Requirements Verified in This Test.

See appendix A for Requirements Details
Requirement # - 527, 640 - 643.

4.4.1.14.3 Test Objectives.

a. Verify that the ASR-11 can process 700 real aircraft targets in any mix of PSR only, PSR/SSR merge, or SSR only targets, in the presence of an additional 300 false PSR reports and 100 false SSR reports, uniformly or nonuniformly distributed in azimuth for a 360° scan, and not be impacted by weather channel processing.

b. Verify that the ASR-11 can process a peak of 250 targets uniformly distributed in a 90° sector.

c. Verify that the ASR-11 can process a peak of 100 targets uniformly distributed across two contiguous 11.25° sectors.

d. Verify that the ASR-11 can process a peak of 16 targets per a 1.3° wedge lasting for not more than two contiguous wedges.

e. Verify that when overload conditions prevail, priority is given to targets closest in range.

f. Verify that when overload conditions prevail, the targets farthest in range are dropped first.

g. Verify that under peak capacity conditions, the ASR-11 delay is no greater than 1.3 seconds for correlated digital PSR reports, exclusive of communication equipment delay.

h. Verify that under peak capacity conditions, the ASR-11 delay is no greater than 0.8 seconds for uncorrelated digital PSR only reports, exclusive of communication equipment delay.

i. Verify that under peak capacity conditions, the ASR-11 delay is no greater than 0.8 seconds for SSR only reports and SSR/PSR merged reports, exclusive of communication equipment delay.

j. Verify that under peak capacity conditions, the ASR-11 delay is no greater than 1.3 seconds for correlated digital PSR/SSR merged reports, exclusive of communication equipment delay.

k. Verify that under peak capacity conditions, the ASR-11 delay is no greater than 1.7 seconds for reconstituted video, exclusive of communication equipment delay.

l. Verify that under peak capacity conditions, the ASR-11 delay is no greater than 0.3 seconds for the communications equipment.

m. Verify that when target load exceeds the capacity, the ASR-11 has internal processing capable of automatically decreasing the number of reports.

n. Verify that the SDT sector mark delay is set up properly to allow for the maximum system latency.

4.4.1.14.4 Test Location.

Stockton

4.4.1.14.5 Test Configuration.

The configuration for the Surveillance Capacity and Delay test is shown in figure 4.4.1.14.5-1. This test will address the capacity and throughput requirements for the ASR-11 to ARTS-IIE automation system interface. The test ARTS-IIE and displays located on the fourth floor of the tower will be used. Capacity and delay for the STARS automation system will be tested when the SIU and STARS are available for use with ARIES.

ARIES will inject a capacity load of beacon replies and fruit at RF into the sum (Σ), difference (Δ), and control (Ω) receive channels of the interrogator. Azimuth data from the ASR-11 encoders will be input to ARIES (not shown in the figure).

The ASR-11 MSSR will operate with an optimized set of Variable Site Parameters with the exception of the interrogator output power, which will be reduced for the interface to ARIES. The interrogator mode interlace pattern will be set to 3/A, 2, C. The test will be performed at the lowest PRF allowable by specification (200 Hz) and repeated at the highest PRF (375 Hz).

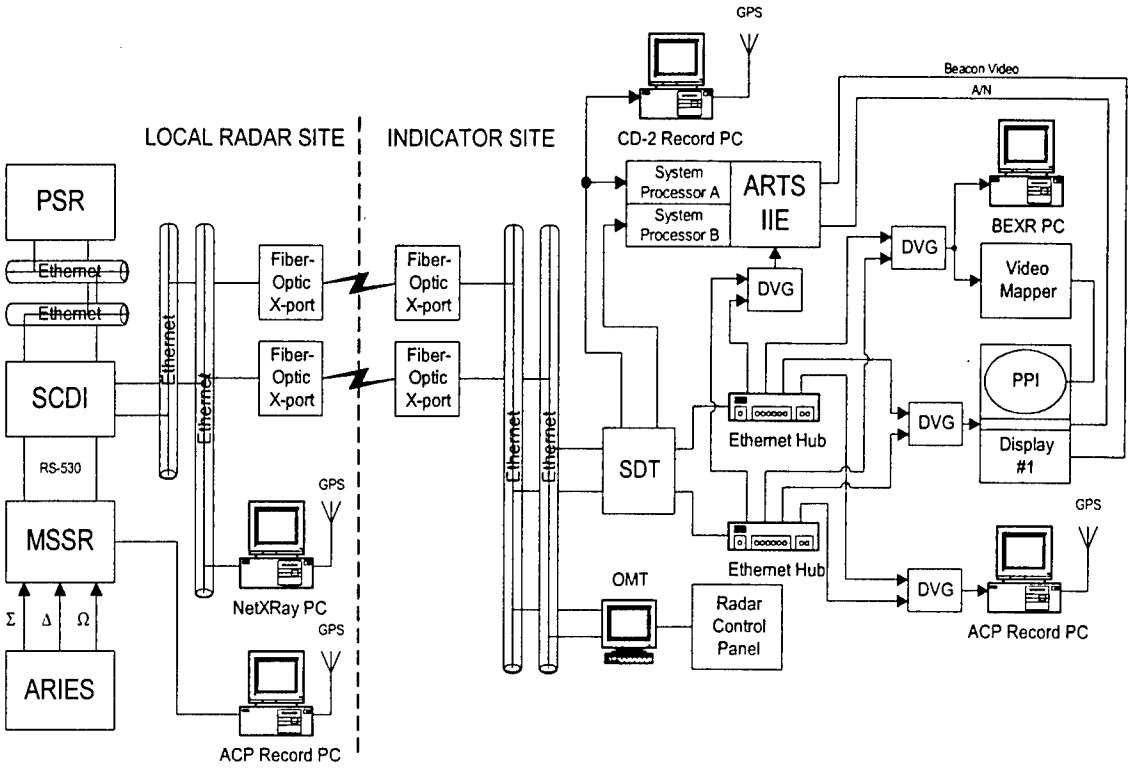


FIGURE 4.4.1.14.5-1. SURVEILLANCE CAPACITY AND DELAY TEST CONFIGURATION

The PSR capacity load will be simulated through downward tilt of the PSR antenna to illuminate close in clutter. Several Variable Site Parameters in the PSR (e.g., low velocity thresholds) may be adjusted to increase the percentage of returns that result in PSR tracks (which have greater throughput delay than plots).

Data will be recorded at seven different points in the system during the test.

A PC (designated NetXRay PC in the figure) equipped with a network interface card and NetXRay LAN sniffer software will record data from the external LAN (at the output of the local SCDI). This PC will also contain a GPS card which connects to a GPS antenna, mounted outside of the shelter. The surveillance data will be time tagged with GPS time.

Two PCs (designated ACP Record PCs) will record and time stamp azimuth data. One PC will record data from the encoders (available at the MSSR cabinet). The second will record the reconstituted azimuth data out of the DVG. Each PC will be equipped with a GPS card interfaced to an antenna for use in time stamping the data.

A PC (designated CD-2 Record PC) equipped with a CD-2 record board will record data from the output of the SDT (located on the fourth floor of the Stockton tower). This data will also be time tagged using a GPS time stamp.

The test ARTS IIE data extraction facility (not shown in the figure) will record and time stamp surveillance data during the test.

A PC (designated BEXR PC) equipped with a Sensis BEXR board will record and process reconstituted video from the DVGs. BEXR will save the data to disk in a CD file format for comparison with data recorded at other points in the system. ASR-11 status and alarm information will be recorded at the remote OMT/SCDI to verify radar health during the test.

4.4.1.14.6 Test Approach.

The ARIES will inject the capacity scenario shown in figure 4.4.1.14.6-1. The scenario contains nominally 700 real targets/scan along with 100 false targets/scan (in the form of beacon reflections).

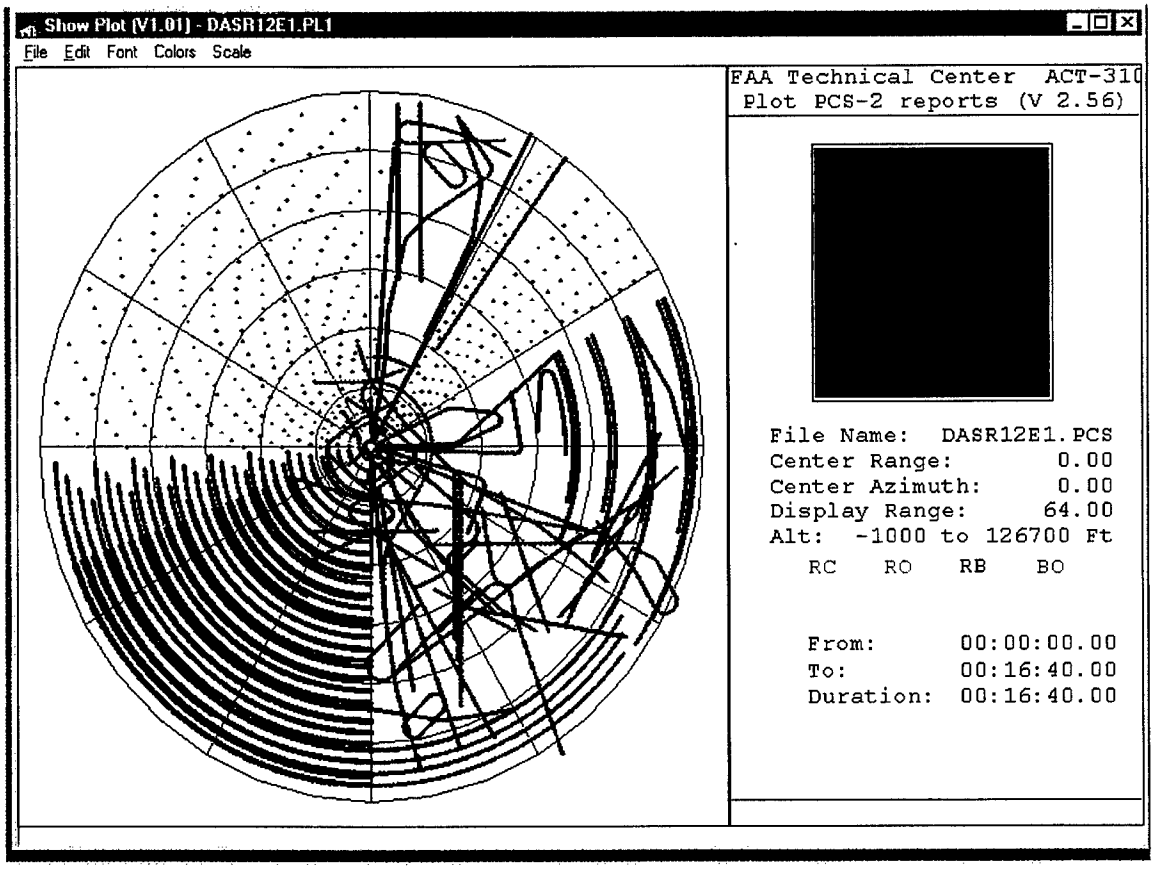


FIGURE 4.4.1.14.6-1. ARIES CAPACITY SCENARIO

The plot shows the full target history for the duration of the file (16:40). The scenario contains both stationary and moving targets with a round reliability of 75 percent. The scenario contains 32 stationary targets in a 2.6° wedge between 31 and 35°, 100 stationary targets in a 21° sector located between 40 and 61°, and 288 stationary targets located between 270 and 0°. The third

quadrant contains 224 targets with the same relative positions as in the fourth quadrant, but which move in a counterclockwise direction. The remaining targets are moving targets located primarily in the first and second quadrants. Of these moving targets, 39 targets are used to test the basic functionality of the interrogator (crossing tracks, emergency codes, etc.).

Along with the target scenario, a maximum load of ATCRBS (10K) and Mode S (200) FRUIT will be injected into the interrogator. The FRUIT is injected with 30 percent in the mainbeam and 70 percent in the sidelobes. The codes of the ATCRBS FRUIT are randomly chosen in the ARIES scenario.

The capacity load of PSR targets will be simulated through downward tilt of the PSR antenna. This approach is taken due to the absence of a PSR test target generator similar to ARIES for the MSSR. The number of false primary targets per scan will be monitored using the statistics on the ASR-11 radar data display when adjusting for the optimum tilt.

This approach to simulating the PSR target load may have several limitations. First, the number of tracks output from the PSR is expected to be lower than output from an optimized radar. Since the throughput delay is normally greater for tracks than for plots, the delays will be skewed toward lower delay times than for a normal configuration. If this ends up being the case, several parameters in the PSR tracker will be modified (e.g., low velocity thresholds) in order to increase the number of PSR tracks.

A second limitation is that the percentage of combined radar/beacon targets is expected to be much lower than would be experienced in the real world. However, this should have much less of an effect on throughput delays than the number of PSR tracks output from the radar.

The test can be divided into two parts: a digital test and an analog test.

The digital capacity test will compare the contents of the three digital surveillance data sets (recorded at the output of the local SCDI (NetXRay), at the output of the SDT (CD-2), and at the ARTS-IIE data extraction subsystem). Beacon reports will be compared with the ARIES scenario for expected results (i.e., data counts as well as performance analysis). Radar reports from the CD-2 and ARTS-IIE data sets will be compared with the NetXRay data (data counts and report content only; no performance analysis). Digital delay times will be taken as the difference between the report time stamp and the boresight time stamp (from the encoder ACP Record data set).

The analog test will be a measure of the timely processing of targets from antenna boresight to the display. Compliance with the reconstituted video delay requirement will be made by first determining the delay between the encoder ACP/ARP data set and the video ACP/ARP data set. The sweep delay VSP will then be adjusted via the SDT CMS to allow a maximum total delay of 1.7 seconds from boresight to sweep. Those targets arriving later than 1.7 seconds will not be output from the DVG. BEXR will record the reconstituted video during the test and store the data in CD-2 format. After the DVG sweep delay has been properly configured, the test

effectively becomes a measure of data counts in the recorded file. The reconstituted video will also be observed on a PPI display during the test.

ASR-11 status and alarms will also be recorded at the remote OMT/SCDI during the test.

4.4.1.14.7 Data Analysis Methods.

The surveillance data recorded during the test will be analyzed using IRES and RBAT. For capacity analysis, the beacon report counts will be compared for expected results with the ARIES scenario file. Targets will be counted for each scan and inspected for compliance with scan, quadrant, sector, and wedge capacity requirements. The beacon data will also be analyzed to ensure that good end-to-end performance (detection, false alarm rate, code validation, etc.) is maintained under a capacity load.

Radar data counts will be compared between the NetXray recorded data set and the other data sets downstream to ensure that there is no data loss in the SDT or ARTS-IIE. Since the source of the radar targets is clutter, radar performance will not be verified in this test. Status messages and RTQCs will also be counted in each data set to ensure no data dropouts.

Alarm data recorded at the remote Operator Maintenance Terminal (OMT) will be inspected to ensure that there are no overload or overflow indications and that there is not an excess number of channel reconfigurations during the test.

Delay of digital reports will be the difference between the GPS time stamped on each report (NetXRay, CD-2, or ARTS-IIE data set) and the boresight time (ACP Record data set - encoder) for the azimuth of the report.

4.4.1.14.8 Test Resources.

a. ARIES

b. PC with network interface card, NetXRay software, and GPS board connected to a GPS antenna

c. CD-2 Record PC with GPS board/antenna

d. ARTS-IIE data extraction with time tagging capability

e. (2) ACP recording PCs with GPS boards/antennas

f. Video recording PC with BEXR board

4.4.1.15 System Control and RMS Operation.

The tests in this section will measure the ASR-11 functional and physical interface with the RMS. The ability of the ASR-11 RMS to reliably provide the means to control and maintain the radar and monitor its performance will be tested.

The System Control and RMS Operation test will be performed at Stockton. The system will be configured in an optimized state. Data recorders will be located at the output of the local SCDI, at the ARTS-IIE, and at the input to the displays. Data will be analyzed to verify that the system reacts as expected to the RMS commands and that there is no interference to the data sent to the automation system as a result of RMS operation.

The System Control and RMS Operation test is divided into seven subsections:

a. OMT/SCDI and RCP Operation
b. System Control and Configuration
c. Equipment Performance Monitoring
d. Alarm Reporting Functions and Fault Isolation
e. Adjustable Parameters
f. Radar Data Display and UNIX Workstation Operation
g. Status Reporting

The requirements verified in the System Control and RMS Operation test are summarized below. See appendix A for Requirements Details.

Requirement # 22, 26, 27, 29, 37, 38, 48, 52, 54, 55, 323, 325, 365, 378, 395, 400- 402, 405, 407, 410, 450-453, 073, 074, 078, 079, 082, 083, 121-124, 132, 158-162, 168, 173, 175-178, 182, 184-194, 197-201, 202.0, 202.1, 202.2, 206-208, 244, 247, 274, 283, 286-288, 291.5, 291.6, 291.7, 291.8, 532, 535, 548-551, 557-565, 578, 580, 583-585, 590-595, 612-614, 623, 624, 626, 629, 633-639, 644-646, 653, 655, 656, 658-661, 663-665, 667-686, 688-698, 702, 703, 714, 715, 732.7, 733-735, 746.1, 815-855, 889, 890, 899, 904

4.4.1.15.1 SCDI/OMT and RCP Operation.

4.4.1.15.1.1 Purpose.

Ensure that local and remote OMTs have the same functionality and that RMS functions can be accessed at each location. Ensure that system control can be transferred to/from each location without problems and in a timely manner.

4.4.1.15.1.2 Requirements Verified in This Test.

See appendix A for Requirements Details
Requirement # - 26, 27.1, 052, 054, 189, 190, 644, 645, 646, 655, 656, 658, 659, 660, 661, 663-665, 667-686, 688-698, 815, 818, 819, 820, 850, 851, 853, 854, 855

4.4.1.15.1.3 Test Objectives.

a. Verify that the local SCDI/OMTs and their interfaces to the PSR, MSSR, FMAC, and data remoting equipment are dual redundant.

b. Verify that the on-line-standby OMT/SCDI maintains the same configuration as the on-line-selected OMT/SCDI in order to provide the maximum transparency to the user in the event of a reconfiguration.

c. Verify that equipment control selections issued to the on-line-selected OMT/SCDI are duplicated in the on-line-standby SCDI such that the equipment configuration is maintained in the event of a reconfiguration.

d. Verify that the Remote OMTs have the same functionality as the local OMTs except for the radar data display and VSP control.

e. Verify that only operational commands can be actioned by OMTs/SCDIs in the on-line role.

f. Verify that operational and maintenance OMT/SCDI commands can be actioned by OMTs/SCDIs functioning in the maintenance role.

g. Verify that the selected OMT/SCDI serves as the on-line-selected RMS and provides the maintenance operator with the capability to monitor and control all the radar site equipment.

h. Verify that the on-line-standby OMT/SCDI provides the maintenance operator with the capability to monitor but not control any radar site equipment.

i. Verify that only one OMT/SCDI can be in the selected mode at a given time and that it is an invalid state for two on-line OMTs/SCDIs to be in the standby mode at the same time.

j. Verify that the RMS is able to operate in local, remote, or no controller mode.

k. Verify that accurate status information is provided to all OMTs and RCPs whether the RMS is in local, remote, or no controller mode.

l. Verify that the switch from one mode to another occurs within an average time of 1 second and a maximum time of 3 seconds.

m. Verify that when in no controller mode, system control is given to the first radar control panel that requests it or to the first remote OMT that provides a valid user/password combination.

n. Verify that the control panels and OMTs are DASR points of control.

o. Verify that only one control point is designated as the primary point of control (locking out all others) for the radar site equipment.

p. Verify that the RMS allows the same control and monitoring capability of the ASR-11 from any OMT.

q. Verify that the RCP can take and release control of the radar and provides an indication when it is in control of the system.

r. Verify that system control can be transferred between local OMTs, remote OMTs, and the radar control panel without conflicts.

s. Verify that the transfer of control between two control points requires deliberate and coordinated action at each of those control points.

t. Verify that visual signals are provided at both control points during control transfers.

u. Verify that system control can be transferred between local OMTs, remote OMTs, and the radar control panel without effecting the data sent to the automation systems.

v. Verify that the status of each OMT and RCP is accurately reported by the RMS.

w. Verify that if an on-line OMT/SCDI fails, the RMS will automatically switch the other OMT/SCDI on-line (assuming autoreconfiguration is enabled).

x. Verify that the RMS can detect a communications failure to an OMT and reconfigure to use the other communications input.

y. Verify that RMS control transitions to no controller mode upon failure of the OMT or RCP in control of the system at the time.

z. Verify that the accurate information is available at the local and remote OMTs, sufficient to certify PSR and MSSR performance.

aa. Verify that it is possible to perform maintenance on an OMT/ SCDI or its interfaces without degrading normal ASR-11 operation.

bb. Verify that no remote monitoring subsystem function in the maintenance mode can cause loss of radar data to automation.

4.4.1.15.1.4 Test Approach.

The remote and local OMTs will be inspected to ensure that the same controls are available at each location and the system controls will be exercised from each location. The OMT/SCDIs

will be inspected to ensure that the interfaces to the PSR, MSSR, FMAC, and data remoting equipment are redundant. Throughout the test, the configuration of each terminal will be inspected to ensure that each redundant SCDI maintains the same configuration. Control commands will be issued to ASR-11 subsystems, and the reported configuration of those subsystems will be inspected at each OMT and RCP for accuracy.

OMTs will be sequentially transitioned into on-line role. Maintenance commands will be attempted from the on-line role. The OMTs will then be sequentially transitioned to maintenance role and the system exercised to ensure that all commands are accessible in maintenance role.

Each local OMT will be sequentially transitioned to on-line-selected mode. Commands will be exercised to verify the ability to monitor and control all site equipment from the on-line-selected mode. Each OMT will then be transitioned to on-line-standby mode. In standby mode, the ability to monitor but not control the radar site equipment will be verified. Attempts will be made to cause a conflict situation where two OMTs are simultaneously selected or two OMTs are simultaneously in standby.

RMS control will be transferred between local and remote OMTs and RCPs. Attempts will be made to take system control from two different locations simultaneously in order to create a conflict situation. The time for each transfer will be measured. Control point status will be inspected for accuracy. Data will be recorded throughout the transfers to ensure that there is no interference to data feeding the automation system.

With autoreconfiguration enabled, faults will be simulated for an OMT, for an RCP, and for communication interfaces feeding these units. The RMS will be inspected to ensure that the failure is detected and correctly reported and that RMS control transitions to no controller mode. Data will be recorded throughout the event to ensure that data fed to the automation system is continuous.

OMT maintenance will be simulated by first transitioning into maintenance mode. Data will be recorded at the output of the data to ensure that the maintenance on the OMT does not effect data to the automation system.

The ability to report critical certification parameters consistently to local and remote OMT locations will be verified. The system will be altered to effect the critical performance parameters. Both the remote and local OMTs will be inspected to ensure that the changes are accurately reflected in each location.

4.4.1.15.1.5 Data Analysis Methods.

Data recorded during this test will be analyzed using RBAT and IRES. The continuity of data to the automation system will be verified through analysis of the data for the times when system control is transferred, RMS roles are changed, and when OMTs or RCPs fail.

4.4.1.15.1.6 Test Resources.

a. PC with network interface card, NetXRay software
b. RBAT
c. IRES
d. Stopwatch

4.4.1.15.2 System Control and Configuration.

4.4.1.15.2.1 Purpose.

Verify that the ASR-11 provides a means (via the RMS, CMS, or manual operation) to effectively control and configure redundant elements of the PSR, MSSR, SDT, and APG.

4.4.1.15.2.2 Requirements Verified in This Test.

See appendix A for Requirements Details
Requirement # - 26, 29, 37, 38, 48, 378, 395, 399, 400, 401, 402, 405, 450, 451, 452, 73, 74, 78, 82, 83, 158, 159, 160, 168, 175, 176, 177, 178, 179, 180, 183, 184, 185, 186, 187, 188, 206, 207, 208, 244, 274, 275, 283, 286, 287, 288, 745, 746, 748, 818, 888, 889, 890

4.4.1.15.2.3 Test Objectives.

a. Verify that the time required for the PSR Group (PSR electronics) to be fully operational from initial start is no more than 7 minutes.

b. Verify that the DASR system incorporates redundancy in transmitters, receivers, modems, transmission lines, and digital signal processors.

c. Verify that redundant subsystems are reconfigurable automatically within 4 seconds.

d. Verify that current adaptive clutter map and adaptive STC maps are maintained by the on-line-standby PSR channel in order to minimize the loss of data or generation of false reports to the end user in the event of a reconfiguration.

e. Verify that equipment control selections issued to the on-line-selected PSR channel are duplicated in the on-line-standby PSR channel such that the equipment configuration is maintained in the event of a reconfiguration.

f. Verify that only one PSR channel can be in the selected mode at a given time.

g. Verify that it is an invalid state for two on-line PSR channels to be in the standby mode at the same time.

h. Verify that only operational commands can be actioned by PSR channels in the on-line role.

i. Verify that operational and maintenance commands are actioned by PSR channels functioning in the maintenance role.

j. Verify that the PSR end-to-end tests, Fault Isolation tests, and stability tests can be run with the effected channel components in maintenance role.

k. Verify that the PSR channels accept commands from the OMT within the selected SCDI and provide status reports to both SCDIs.

l. Verify that if internal built-in test equipment (BITE) detects a fault in either the on-line, operational target or weather channel, the PSR automatically reconfigures to the redundant hot standby set of channels (assuming autoreconfiguration is enabled).

m. Verify that the APG provides continued operation even when the PSR and/or the SSR are turned off.

n. Verify that antenna drive motors are redundant.

o. Verify that each antenna drive assembly has its own controller/starter including control power supplies, control/status interconnections and any other associated elements.

p. Verify that during antenna start, both drive motor assemblies, if serviceable, are engaged through a common "ON" function.

q. Verify that it is not possible to stop the antenna while either the PSR or the MSSR are in operational mode from either the OMTs or the Radar Control Panels.

r. Verify that pedestal control panel and the control and monitoring interlocks operate properly and that reapplication of power to the drive motors only comes from the point of control.

s. Verify that polarization, ADG selection, antenna start, and individual motor start/stop controls are available in both operational and maintenance role.

t. Verify that the transmitter has control mechanisms so that the transmitter can be controlled by the PSR control and monitoring system of the OMT.

u. Verify that the transmitter can be controlled manually (after a reset).

v. Verify that the transmitter controls including TX amplifier (1-8) RF on/off and emergency inhibit reset operate properly.

w. Verify that RMS features operate properly in inhibiting the PSR and MSSR transmitters from radiating.

x. Verify that the transmitter monitoring is not impaired by the operation of the RF blanking.

y. Verify that the PSR control and monitoring system can effectively control the SDP.

z. Verify that the proper operation of the following control commands:

1. Start/stop signal processing (Channel Processing Active/Idle)

2. REX data stream - (Either REX A or REX B)

3. Clutter map selections (freeze, reset, rapid store)

4. Target STC selections (preprogrammed, off, clear)

5. Weather STC selections (preprogrammed, off)

6. Target and weather beam selections (high, low, auto - preprogrammed)

7. Frequency selections (agile, fixed)

8. Permanent echoes on/off

9. Target and Weather preprogrammed STC map selections (PPM1, PPM2, PPM3)

10. Adaptive range filters (on, off)

11. Adaptive azimuth filters (AP Fix) (on, off)

aa. Verify that system control functions are included within the plot processor, providing for local and remote control and monitoring facilities.

bb. Verify that the MSSR standby channel receives the raw target reports from the on-line channel.

cc. Verify that the local MSSR CMS terminal provides effective control of the MSSR.

dd. Verify that there are no conflicts in controlling the MSSR from the OMT RMS or the local MSSR CMS.

ee. Verify that configuration and status information is reported correctly and consistently at the OMT and MSSR CMS.

ff. Verify that MSSR transmitter blanking in up to eight predefined sectors, programmed via the CMS terminal functions properly.

gg. Verify that it is possible to select either MRSM channel/transponder as the operational transponder with the nonselected channel always remaining in a standby mode for immediate operation.

hh. Verify that if a failure is detected in the selected MRSM transponder, change over to the standby transponder is automatic.

ii. Verify that the VDCU controls for selecting search and weather video for display work properly.

4.4.1.15.2.4 Test Approach.

The PSR, MSSR, and SDT electronics will be reset and the time that the system takes to become operational (as reported by the RMS) will be measured. The time to reconfigure redundant PSR, MSSR, communications, and SDT channels will be measured.

Data will be recorded while redundant PSR, MSSR, and SDT channels are swapped. The data will be analyzed to ensure that the performance does not change with either channel online. This will indicate that the redundant channels have the same configuration (e.g., adaptive maps, reflector maps, etc.).

Commands will be issued from the OMT to ensure that PSR end-to-end tests, fault isolation tests, and stability tests can be controlled and that results are accurately reported to the RMS.

The interaction between the pedestal control panel and the OMT in controlling the APG will be exercised. Smooth transfer of control between the two terminals will be verified. The PSR and MSSR will be turned off and the APG verified to continue operating. APG control commands will be exercised to ensure that the antenna, drive motors, and ADG can be effectively controlled.

Manual and RMS control of the PSR and MSSR transmitters (e.g., disabling the power output, disabling individual amplifiers) will be exercised. The output power will be measured using a power meter to ensure that the commands work properly.

Data will be monitored on the radar data display and recorded at the output of the radar while PSR SDP commands are exercised. The data will be analyzed to ensure that the changes produce the expected results.

The interaction between the MSSR CMS and OMT in controlling the interrogator will be exercised. Smooth transfer of control between the two terminals will be verified. Data will be

recorded while MSSR channels are reconfigured (through commanded channel changes and as the results of injected faults). The MSSR status reported on the CMS and OMT will be compared for consistency.

An MRSM channel will be faulted to ensure that the standby channel switches on-line.

The VDCU controls will be exercised to ensure that the requested video is properly displayed.

4.4.1.15.2.5 Data Analysis Methods.

Data recorded during this test will be analyzed using RBAT and IRES. Data will be analyzed to ensure that performance is maintained with either redundant element on-line. The continuity of data to the automation system will be verified through analysis of the data for the times when system control is transferred between the OMT and pedestal control panel and between the OMT and MSSR CMS.

4.4.1.15.2.6 Test Resources.

a. PC with network interface card, NetXRay software
b. RBAT
c. IRES
d. Stopwatch

4.4.1.15.3 Equipment Performance Monitoring.

4.4.1.15.3.1 Purpose.

Ensure that the RMS monitors ASR-11 performance and accurately reports results to the user.

4.4.1.15.3.2 Requirements Verified in This Test.

See appendix A for Requirements Details
Requirement # - 199, 200, 201, 202, 247, 291, 633, 634, 635, 636, 637, 732, 818, 826

4.4.1.15.3.3 Test Objectives.

a. Verify that the RMS reports accurate performance information for each subsystem (e.g., PSR, SSR, HVAC, backup power system, and facility) to ensure the system is operating within certified limits.

b. Verify that functionality is provided to monitor the performance of critical radar parameters such as output power, stability, high beam, low beam, and weather minimum discernable signal (MDS) levels for both short and long pulse modes.

c. Verify that a tally is kept of the numbers and types of messages processed in the last scan, last minute, and last hour are reported to the operator on request.

d. Verify that windows configured via the RMS, allow for the correct processing of permanent echoes.

e. Verify that PSR permanent echo reports and SSR PARROT detection performance statistics presented to the user on the OMT are accurate.

f. Verify that a warning message is provided to the RMS if either the PSR or SSR target reports fall below a VSP probability of detection threshold.

g. Verify that PSR and SSR collimation statistics presented to the user are accurate.

h. Verify that detection of marginal operation results in the generation of a warning message.

i. Verify that smoothing and filtering of the results is applied to prevent the generation of false alarms and reports.

j. Verify that performance and certification results are accurately and consistently reported at each OMT.

k. Verify that when the RF power is reduced by more than 1 dB below its preset level, a fault is reported by the BITE.

l. Verify that status of critical radar parameters is accurately presented to the maintenance operator along with local and remote OMT display of the following numeric values on a certification screen common to the PSR and MSSR:

1. PSR transmitter short pulse and long pulse forward power
2. PSR Antenna reverse power
3. PSR receiver target channel high beam short pulse and long pulse MDS
4. PSR receiver weather channel short and long pulse MDS
5. MSSR Sum and Control transmitter forward power (on-line and standby channels)
6. MSSR Sum and Control Reverse Power (on-line and standby channels)
7. MSSR Sum, Difference and Control channel Sensitivities (83 dBm ± 3 dB)

m. Verify that the critical PSR and MSSR certification parameters presented to the maintenance operator on the OMT can be checked for accuracy using external calibrated test equipment.

4.4.1.15.3.4 Test Approach.

Data will be recorded and analyzed to ensure that test targets that are used to judge system health (i.e., search and beacon RTQCs, PSR reports from permanent echo and MTI reflector returns, and MSSR reports from the MRSM) are consistently output. RMS window adjustability for these test targets will be exercised during the recording to ensure that the RMS reports the appropriate warning messages during marginal operation.

Data will be recorded at the same time that RMS performance statistics are reported on the screen. The recorded data will be analyzed to ensure that the results of the RMS reports are accurate. Statistics will be determined from the recorded data and compared with the values that the RMS reports to the user for accuracy.

The ability of the ASR-11 RMS to accurately report certification information to the user will be evaluated. External test equipment will be used to measure ASR-11 certification parameters including PSR and MSSR transmitter power, antenna reverse power, and target and weather receiver MDS. The ability to adjust offsets in the PSR and MSSR via the RMS to report accurate certification information will be verified. In addition, VSPs that are used as thresholds for these important parameters will also be exercised to ensure that the proper alarms are reported to the user when these parameters fall out of tolerance.

4.4.1.15.3.5 Data Analysis Methods.

Data recorded during this test will be analyzed using RBAT and IRES. Data will be analyzed to ensure that the test targets are consistently output from the system. Performance results will also be produced from the recorded data and compared with the values that were reported to the user via the RMS.

4.4.1.15.3.6 Test Resources.

a. PC with network interface card, NetXRay software
b. RBAT
c. IRES
d. Peak Power Analyzer

4.4.1.15.4 Alarm Reporting Functions and Fault Isolation.

4.4.1.15.4.1 Purpose.

Ensure that ASR-11 BIT reports any radar malfunction promptly and that FI provides sufficient information to the maintenance technician to locate and replace the faulted equipment.

4.4.1.15.4.2 Requirements Verified in This Test.

See appendix A for Requirements Details
Requirement # - 121, 122, 123, 124, 132, 181, 182, 197, 198, 818, 831, 833, 834, 835, 836, 837, 838, 839, 840, 841

4.4.1.15.4.3 Test Objectives.

a. Verify that results of fault detection/fault isolation are accurately reported to the RMS for display on the local and remote OMTs.

b. Verify that a fault reset input is provided for resetting fault status.

c. Verify that FI routines are performed automatically on failed equipment in the event of an automatic reconfiguration.

d. Verify that the diagnostic results are made available and displayed so they can be understood without reference to other documentation.

e. Verify that alarms and alerts reporting is consistent at local and remote OMTs locations.

f. Verify that alarms and alerts are reported consistently, independent of what level of RMS menu is accessed.

g. Verify that RMS performs a discriminating function to minimize the declaration of alarms and alerts caused by transient conditions.

h. Verify that all out of tolerance and status conditions identified as alarms and alerts are reported immediately and time tagged and stored in order of occurrence.

i. Verify that the RMS automatically displays a return to normal message for each applicable parameter when the alarm or alert clears.

j. Verify that the RMS permits the termination of fault isolation and maintenance tests at any time by maintainer action at an OMT.

k. Verify that the RMS can initiate manual fault isolation on a channel placed in maintenance by the RMS or placed in maintenance by an operator at an OMT.

4.4.1.15.4.4 Test Approach.

This test will be performed at the same time as the maintainability demonstration. Faults will be inserted into the system. The ability of the ASR-11 to detect and isolate failures and report the

faulted LRUs consistently at local and remote locations will be verified. RMS reporting of BIT/FI in an unambiguous manner and the RMS control of FI will also be evaluated.

4.4.1.15.5 Adjustable Parameters.

4.4.1.15.5.1 Purpose.

Ensure that the Customer Adaptation Parameters provide enough flexibility and functionality to optimize the system and that these parameters work as designed. Ensure that parameters can be adjusted to control PSR, MSSR, DTE, and SDT equipment.

4.4.1.15.5.2 Requirements Verified in This Test.

See appendix A for Requirements Details
Requirement # - 048, 323, 325, 365, 548, 549, 550, 551, 557, 558, 559, 560, 561, 562, 563, 564, 565, 583-585, 590-594, 612, 613, 614, 623, 624, 625, 626, 638, 639, 821, 822, 825, 899, 900, 901, 902, 903, 904

4.4.1.15.5.3 Test Objectives.

a. Verify that the ASR-11 adjustable parameters can be modified as expected and allow effective configuration and optimization of the ASR-11.

b. Verify that sector blanking windows can be configured and adjusted effectively.

c. Verify that SSR emergency codes override blanking.

d. Verify that RAG windows are adjustable anywhere within the instrumented range of the radar for surrounding returns from permanent echoes and MTI reflectors.

e. Verify that plot processing commands for masking out ground traffic operate as expected and are effective.

f. Verify that plot amplitude thresholding works effectively and can be effectively controlled by the RMS.

g. Verify that areas (up to 25) can be set up in the track processor to inhibit track initiation of tracks (e.g., in the areas of roads).

h. Verify that the velocity editor is effective in eliminating slow moving targets.

i. Verify that the maintenance operator can enable/disable the output of primitive reports.

j. Verify that it is possible for the maintenance operator to enable/disable the output of edited target reports in the radar data stream.

k. Verify that the RMS accurately counts the number of target reports eliminated by velocity editing and the number of primitives eliminated when these features are enabled.

l. Verify that SDT/DVG parameters work within their intended range to align search and beacon video on the display.

m. Verify that operator adjustment is provided so that analog and digital data can be aligned in time on the display.

n. Verify that digital delays for the beacon and uncorrelated search data and sector marks are set so that surveillance data is automatically sent immediately after sector mark whose azimuth is just prior to the surveillance data true azimuth.

4.4.1.15.5.4 Test Approach.

ASR-11 Customer Adaptation Parameters will be adjusted to verify that the ASR-11 can be effectively controlled through the RMS. (Note: Prior to execution of this test, the baseline set of ASR-11 parameters will be recorded). The operation of many of the system parameters will be evaluated during the Government optimization phase of System Test. The adjustability of the parameters and their effectiveness in controlling the system will be evaluated. The Customer Adaptation Parameter set will also be judged for completeness to ensure that the tools necessary to optimize and operate the ASR-11 are available to the user (i.e., not only available in the Raytheon Adaptation Parameter set).

Target of Opportunity data will be recorded during system optimization and during dedicated RMS tests. The data will be recorded at the output of the SCDI while Customer Adaptation Parameters are exercised. Parameters that will be controlled will include:

a. Permanent echo and MRSM location data
b. Antenna alignment settings
c. General tracker (e.g., coast count, velocity threshold)
d. Track initiation inhibit zones (25)
e. Primitive target reporting zones (25)
f. General weather (e.g., map vector limit, map compaction levels)
g. Sector blanking (no reporting) zones (10)
h. Initial startup control setting
i. Initial startup selections (e.g., in-use beam STC maps)
j. UNIX environment limits (e.g., maximum number of open windows)
k. Local site data (e.g., name, ASTERIX SIC/SAC)
l. Transmitter blanking (no RF output) zones (8)
m. Weather calibration thresholds

n. Constant false alarm thresholds (per Doppler filter)
o. Velocity threshold over-ride zones

In addition to Customer Adaptation Parameters, Raytheon Adaptation Parameters will be exercised to ensure proper operation. The Government does not presently have access to these second level engineering VSPs. However, adjustment of some of these parameters will be necessary during Government optimization at future sites and the functionality of these parameters needs to be tested during System Test. Typical second level engineering VSPs include:

a. Communication port definition tables
b. Site equipment configuration tables
c. General facilities monitoring logic tables
d. Plot processing (cluster validation VSPs and complex cluster VSPs)
e. Detection/plot/track overload thresholds
f. Detection overload protection response VSPs
g. Doppler filter editing function table
h. Plot amplitude thresholding function responses
i. Plot overload protection responses
j. Track overload protection responses
k. General radar combiner parameters
l. Weather processing adaptive filter clutter thresholds
m. General SDP data (e.g., recorded data default file names)

4.4.1.15.5.5 Data Analysis Methods.

The target of opportunity data will be analyzed using RBAT and IRES to ensure that the parameter adjustments produced the expected results.

Data recorded during optimization will be analyzed to ensure that the system can be optimized to meet operational requirements. The parameter settings will recorded at the start of each data recording to allow assessment of the parameter adjustments during data analysis.
PSR and MSSR coverage, percent detection, false alarm rates, will be among the performance requirements evaluated. Government access to parameters needed to optimize the system will be evaluated at this time.

Data recorded during the dedicated RMS tests will be analyzed to ensure that the parameter changes produce the expected results in the data. For example, when blanking or inhibit zones are enabled, the data will be reviewed to ensure that reports (other than emergency reports) are not output in these zones.

The effectiveness of track initiation inhibit and primitive zones will be evaluated through comparison of plot and track stream data. The differences in the two data sets will be reviewed to ensure that plots are available in these zoned areas, but tracks or primitives are not. RMS

reported counts of the number of track reports inhibited will also be accomplished through comparison of the two data streams.

Data will be reviewed on the displays to ensure that the radar and beacon video can be properly aligned and that analog and digital data can be properly aligned in time on the display. Sector mark delay VSPs in the SDT will be adjusted to ensure that video from targets with maximum throughput delay are able to be displayed properly on the PPI.

4.4.1.15.5.6 Test Resources.

a. PC with network interface card, NetXRay software
b. RBAT
c. IRES

4.4.1.15.6 Radar Data Display and UNIX Workstation Operation.

4.4.1.15.6.1 Purpose.

Ensure that surveillance and weather data can be extracted via the Radar Data Display without affecting radar operation. Ensure that workstation functions do not interfere with radar operation.

4.4.1.15.6.2 Requirements Verified in This Test.

See appendix A for Requirements Details
Requirement # - 697, 698, 702, 703, 714, 715, 846, 847, 848

4.4.1.15.6.3 Test Objectives.

a. Verify that data extraction has no adverse impact on normal operation and no effect on data sent to the automation system.

b. Verify that surveillance output data is accurately presented on the radar data display in PPI format.

c. Verify that data can be extracted from the following test points and displayed without effecting data output to the automation system.

1. PSR plot processor output reports (either PPI or B-scope)
2. PSR track processor output reports (either PPI or B-scope)
3. PSR edited targets (either PPI or B-scope)
4. SSR plot extractor output reports (either PPI or B-scope)
5. Combiner output (either PPI or B-scope)

d. Verify that data can be extracted from the following test target channel test points and displayed without effecting data output to the automation system.

1. Compressed Pulse Video Input Magnitude
2. Doppler Filter Video Output Magnitude
3. Composite Constant False Alarm Rate (CFAR) Threshold Magnitude
4. Composite CFAR Detection Vector Magnitude
5. Doppler Merge Magnitude
6. Doppler Merge Filter Number
7. Binary Integrator Output Magnitude Number
8. Binary Integrator Filter Number
9. Clutter Map, high resolution portion
10. Clutter Map, low resolution portion
11. Adaptive STC Map, high resolution portion
12. Adaptive STC Map, low resolution portion
13. Merged STC Map, high resolution portion
14. Merged STC Map, low resolution portion

e. Verify that data can be extracted from the following weather channel test points and displayed without effecting data output to the automation system.

1. Compressed Pulse Video Input Magnitude
2. Doppler Filter Video Output Magnitude
3. Weather Filter Coefficients
4. Map Output

f. Verify that data can be extracted from the following preprogrammed test points and displayed without effecting data output to the automation system.

1. Target STC, high resolution portion
2. Target STC, low resolution portion
3. Weather STC, high resolution portion
4. Weather STC, low resolution portion
5. Weather Beam, high resolution portion
6. Weather Beam, low resolution portion
7. Target Beam, high resolution portion
8. Target Beam, low resolution portion

g. Verify that the local site RMS maintains initialization tables, threshold values, parameter state values, adjustable parameter values, and equipment status and performance data.

h. Verify that no UNIX workstation effects (e.g., hard disk overflow) adversely impact data to the automation system.

i. Verify that data can be backed up to floppy disk without effecting normal ASR-11 operation.

j. Verify that there is protection built into the SCDI workstations to prevent corruption of the operating system and essential file structure.

k. Verify that new software builds can be installed into the off-line workstations without effecting the on-line system performance.

4.4.1.15.6.4 Test Approach.

Data will be extracted on the local SCDI/OMT from each of the available system test points. Surveillance and weather data, output to the automation system, will be recorded simultaneously. The data sent to the automation system will be inspected to ensure that there is no interruption due to the operation of the data extraction utility.

The automation system data set will also be analyzed and the surveillance and weather results compared to the results presented on the radar data display (in PPI format).

Operation of the Sun workstation will also be evaluated to ensure that there are no cases where UNIX faults (e.g., due to hard disk capacity exceeded or too many windows open at the same time) can adversely impact the data sent to the user.

4.4.1.15.6.5 Data Analysis Methods.

Data recorded during this test will be analyzed using RBAT and IRES. Data will be analyzed to ensure that the flow of data to the user is not interrupted. Performance results will also be produced from the plot, track, and weather data streams and compared with the results presented to the user on the radar data display.

4.4.1.15.6.6 Test Resources.

a. PC with network interface card, NetXRay software
b. RBAT
c. IRES

4.4.1.15.7 Status Reporting.

4.4.1.15.7.1 Purpose.

Verify that status is reported completely and accurately for all ASR-11 subsystems.

4.4.1.15.7.2 Requirements Verified in This Test.

See appendix A for Requirements Details
Requirement # - 22, 55, 161, 162, 191, 192, 193, 407, 410, 453, 532, 535, 578, 580, 581, 595, 629, 653, 654, 733, 734, 735, 818, 827, 828, 829, 830, 845

4.4.1.15.7.3 Test Objectives.

a. Verify that the RMS provides status of system elements needed for operation (e.g., PSR and SSR electronics, DTE equipment, SDT, HVAC, backup power systems, system security, and safety control systems).

b. Verify that the RMS monitors and collects operating status, including those of system configuration, mode of operation, point of control, and facilities equipment.

c. Verify that the status sent to the OMTs and the RCP is correct and consistent at each location.

d. Verify that the status indicated on the local and remote OMTs reflects the true status of the system.

e. Verify that the status indicated on the Radar Control Panel reflects the true status of the system.

f. Verify that the point of control location is clearly displayed on the RCP and each OMT.

g. Verify that the status of the control panel is correctly indicated on the panel.

h. Verify that each control point provides a visual indication of its status.

i. Verify that the system status does not change due to a control point transfer.

j. Verify that if a DASR control panel is in control, system status is provided to the OMTs.

k. Verify that if redundant elements are used, then control and status readback functions for both elements are displayed.

l. Verify that, on initial application of power, the DASR electronics (PSR, MSSR, and SDT) perform diagnostic tests and accurately report their operational status to the user via the system RMS.

m. Verify that the status message is sent to the RMS at periodic intervals of once a scan and within a second in the event that the status changes.

n. Verify that APG status is reported accurately at the OMTs. This includes: lubricant oil low level indicator, driver motor over temperature, driver motor currents, lubricant oil over temperature, stow pin interlock status, driver motors (on/off), wind speed, and safety switch platform access.

o. Verify that each PSR channel monitors its equipment and reports a summary status.

p. Verify that PSR status indications are provided for: SDP serviceable/failed, end-to-end test pass/failed, A/D saturation, azimuth data source serviceable/failed.

q. Verify that the plot processing capability accurately provides the following status indications: Target RAG Map Blanking (enabled/disabled), Complex cluster processing (enabled/disabled), Valid cluster checking (enabled/disabled), Input thresholding (enabled/disabled), Output thresholding (enabled/disabled), Amplitude thresholding (enabled/disabled), Input thresholding occurring (status message), Output thresholding occurring (status message), Weather RAG Map Blanking (enabled/disabled).

r. Verify that a tally of generated plots and a tally of suppressed plots is maintained and provided to the maintenance operator upon request.

s. Verify that the track processing capability accurately provides the following status indications to the user: Slow Target Inhibit (enabled/disabled), Primitive Target Inhibit (enabled/disabled), Track Initiate Inhibit (enabled/disabled).

t. Verify that the MSSR system status is provided to PSR SCDIs/OMTs for inclusion in summary site status.

u. Verify that the status indicated on the MSSR CMS is accurate and timely.

v. Verify that MSSR status is consistently reported at the MSSR CMS, local OMT, remote OMT, and RCP.

w. Verify that DTE status is accurately reported at each RMS location.

x. Verify that the SDT CMS accurately reports status and that this status is consistent among other RMS locations.

y. Verify that during an overload condition, a warning indication is displayed on the OMTs along with an indication of how many plots have been deleted and that the status message indicates the overload condition.

4.4.1.15.7.4 Test Approach.

The ASR-11 status reported to the user will be verified for accuracy and consistency. Status will be inspected at the local and remote OMTs, at the MSSR CMS, at the SDT CMS, at the pedestal control panel, and at the RCPs. Data will also be recorded at the output of the local SCDI and at the output of the SDT and analyzed to ensure that the correct status is presented to the automation system. Actions will be taken on the RMS to change point of system control and change the configuration of on-line components of the DASR. The status will be reviewed to ensure that the correct information is displayed at each location.

4.4.1.15.7.5 Data Analysis Methods.

Recorded data will be analyzed using RBAT and IRES. The time of an action (e.g., transfer of system control) will be recorded during the test. The ASTERIX and CD formatted data will be reviewed to verify that the status correctly changed. The time for the status to change will also be recorded.

4.4.1.15.7.6 Test Resources.

a. PC with network interface card, NetXRay software
b. RBAT
C. IRES

4.4.1.16 Remote Maintenance Monitoring.

The ASR-11 will use the existing interface of the Remote OMT for remote system monitoring and control of the radar in the short term (i.e., during System Test). Tests of the Remote OMT interface to the ASR-11 are described in automation system interface (i.e., STARS, ARTS-II/III) sections, and RMS Operation sections of this plan.

The ASR-11 is planned to interface to the NIMS, which will allow for remote system monitoring and control of the radar from a centralized monitoring facility. A proxy agent will be developed for the ASR-11 (after System Test) to enable the interface to NIMS. Therefore, the test of the NIMS interface will take place at a future date. ACT-330 will test the interface at that time.

4.4.1.17 ASR-11 versus ASR-7 Comparison.

4.4.1.17.1 Purpose.

This test will compare the performance of the ASR-11 to that of the existing ASR-7/Mode S Interim Beacon Interrogator (IBI) Mode at the Stockton key site. The objective of this comparison is to ensure that no capabilities are lost with the introduction of the ASR-11 into the NAS.

4.4.1.17.2 Requirements Verified in This Test.

This test verifies that the ASR-11 performs as good or better than the ASR-7 at Stockton.

4.4.1.17.3 Test Objectives.

a. Verify that the ASR-11 MSSR performance meets or exceeds the performance of the existing Mode S operating in IBI mode.

b. Verify that the ASR-11 PSR performance meets or exceeds the performance of the existing ASR-7.

c. Verify that the ASR-11 weather reporting performance meets or exceeds that of the existing ASR-7

4.4.1.17.4 Test Location.

Fourth floor of the Air Traffic Control Tower (ATCT) at the Stockton key site.

4.4.1.17.5 Test Configuration.

A dedicated ARTS-IIE system has been installed on the fourth floor of the Stockton ATCT for use by the ASR-11 test program. This system is configured to mirror, as closely as possible, the configuration of the operational Automated Radar Tracking System (ARTS) in use at the site. Two Radar Alphanumeric Display Subsystem (RADS) displays and an analog mapper are also provided on the fourth floor. For this test, one RADS will display ASR-11 video and the other will display ASR-7 video.

The test configuration is shown in figure 4.4.1.17.5-1. The RADS displays will be located side by side for comparison purposes. The ASR-11 RADS will be driven directly from a DVG. The ASR-7 RADS will receive radar and beacon video and triggers from the ARTS-IIE. (For simplicity, the figure shows the radar feed directly to the display.)

Raw beacon video output from the ARTS-IIE will feed a PC-equipped with a BEXR board. Reconstituted beacon video output from an ASR-11 DVG will feed a second BEXR PC. The BEXR will process the beacon video and store the reports to disk for use in a digital comparison.

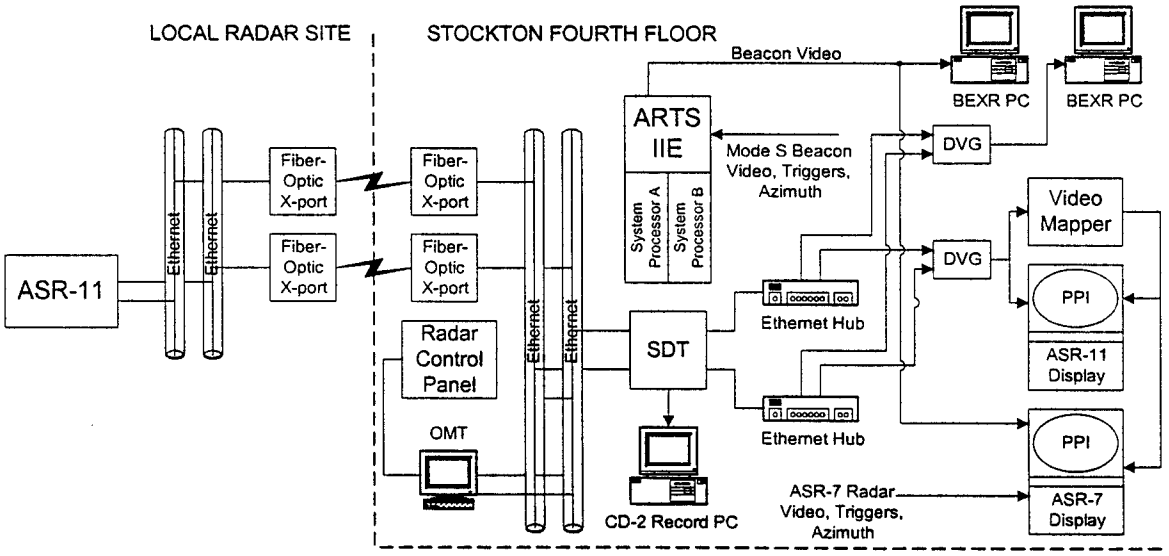


FIGURE 4.4.1.17.5-1. ASR-11 VERSUS ASR-7/MODE S TEST CONFIGURATION.

4.4.1.17.6 Test Approach.

This test will be run in conjunction with the AT evaluations described in section 4.4.2.1 of this document. Performance comparison tests will utilize targets of opportunity. The ASR-7 and Mode S will be operating in their normal operational modes with their output video driving the test ARTS system and one of the displays on the fourth floor. The ASR-11 will be fully optimized with one DVG driving the other fourth floor display.

Four simultaneous data recordings of Mode S and ASR-11 MSSR data will be accomplished for beacon performance comparisons. Mode S data will be captured at the sensor utilizing internal data extraction capabilities. Digital ASR-11 data will be recorded at the output of the SDT using a PC-equipped with a CD-2 record board. Raw beacon video will be recorded from the output of the test ARTS and at one of the ASR-11 DVGs using BEXR PCs. This data will be analyzed and compared to determine performance characteristics of each system.

Radar and weather performance will be determined by visual comparison of target/clutter presentations on side-by-side displays. ASR-11 PSR VSPs will be modified to mimic ASR-7 blanking zones for these tests.

4.4.1.17.7 Data Analysis Methods.

Recorded beacon data will be analyzed using the RBAT and IRES analysis tools. Beacon performance comparisons will be based on the following parameters: probability of detection, false alarm rate, split rate, Mode 3/A and C reliability, and Mode 3/A and C validation percentage.

4.4.1.17.8 Test Resources.

a. PC equipped with CD-2 data recording card
b. PC equipped with BEXR hardware and software (2)
c. IRES Data Analysis Software
d. RBAT Data Analysis Software

4.4.1.18 Transition Switchover.

4.4.1.18.1 Purpose.

This test will verify that the ASR-11 features for providing a fast switchover between the ASR-7 and the ASR-11 work properly.

4.4.1.18.2 Requirements Verified in This Test.

See appendix A for Requirements Details
Requirement # 49, 775, 776

4.4.1.18.3 Test Objectives.

a. Verify that the ASR-11 system design and installation allows for a transition period between the existing system and the new ASR-11 system.

b. Verify that the transition switchover includes all required functions necessary to return the site to a fully operational status, and take no longer than 5 minutes to complete. (Note that adjustments to the automation system, i.e., realignment of maps and displays are not included.)

c. Note time to transition ASR-11 into and out of NAS (including automation system).

4.4.1.18.4 Test Location.

Fourth Floor, Stockton Control Tower, Stockton, CA.

4.4.1.18.5 Test Configuration.

The equipment configuration for the fourth floor of the Stockton tower is shown in figure 4.4.1.18.5-1. Three DVGs will be fed ASR-11 data through the dual ethernet LAN as well as video from the ASR-7/Mode S. One of these DVGs will supply beacon and azimuth data to the ARTS-IIE system. A single PPI display will be configured to receive the radar, azimuth, and trigger outputs of the second DVG and beacon video and alphanumerics from the ARTS. The third DVG will feed beacon and azimuth data to a BEXR PC. Another BEXR PC will be used to record raw beacon video from the ARTS. A PC equipped with a CD-2 record board will record ASR-11 digital messages output by the SDT.

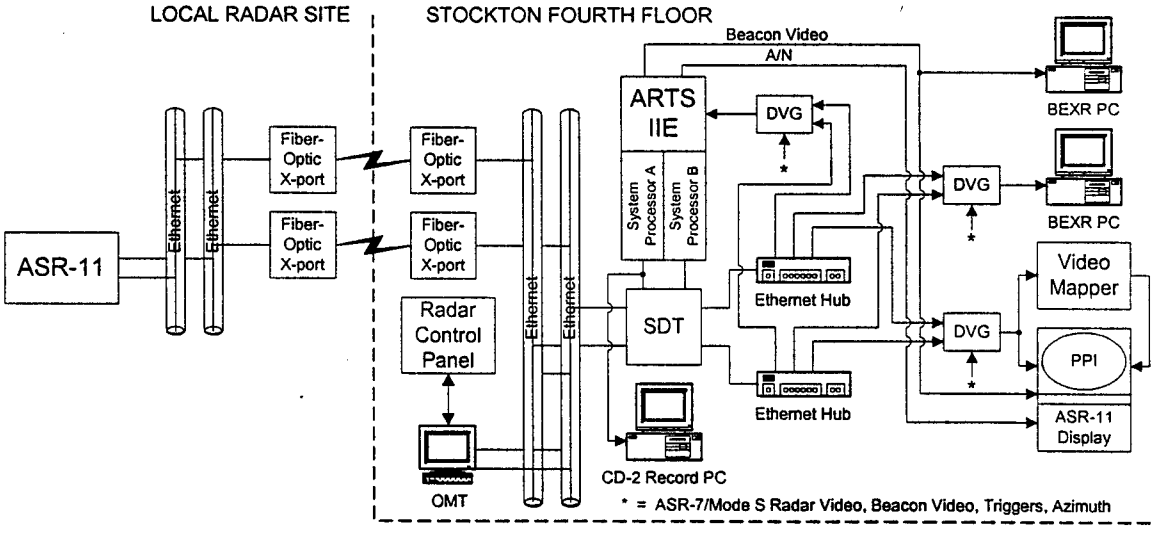


FIGURE 4.4.1.18.5-1. TRANSITION SWITCHOVER TEST CONFIGURATION

4.4.1.18.6 Test Approach.

This test is intended to verify availability of appropriate radar data (either ASR-11 or ASR-7/Mode S) at the outputs of the SDT and DVGs within the required 5-minute switchover time. The time required for realignment of the ARTS, displays, and mapper will not be considered during this test. Raytheon procedures for complete switchover, including all necessary alignments, will be dry run on the fourth floor system prior to any attempts involving the operational ARTS. During this dry run, the switchover procedures will be red-lined as necessary to ensure switchover attempts on the operational ARTS run as smoothly as possible.

Targets of opportunity will be used to perform this test. At the start of the test, ASR-11 and ARTS equipment on the fourth floor will be configured to allow display of ASR-7/Mode S data. Continuous data recordings will be started at the CD-2 and BEXR PCs shown in figure 4.4.1.18.5-1. After several scans of data have been collected, ASR-11 outputs will be selected through execution of the proper commands at the SDT CMC. Status of the ARTS, ASR-7, Mode S, and all ASR-11 equipment will be verified before and after this switchover occurs. Any anomalies with system status will be noted. After 5 minutes has expired, ASR-11 equipment status will be noted and availability of target output data will be verified. Several scans of ASR-11 data will be collected and a switch back to the ASR-7/Mode S will be executed. Any anomalies witnessed during this transition will be noted. After 5 minutes, status of the ASR-11 switching equipment will be noted and availability of ASR-7/Mode S output data will be verified. Several scans of ASR-7/Mode S data will be collected before the recordings are stopped.

4.4.1.18.7 Data Analysis Methods.

The three recorded data files will be analyzed using IRES and RBAT. Discontinuities in the beacon tracks will be used to determine data switchover time relative to execution of the switching commands at the CMC. The files will be compared to one another to evaluate beacon performance and the content of each file.

4.4.1.18.8 Test Resources.

a. PC equipped with CD-2 data recording card
b. PC equipped with BEXR hardware and software (2)
c. Stop Watch
d. IRES data analysis software
e. RBAT data analysis software

4.4.2 System Operational Tests.

4.4.2.1 Functional Performance - AT Evaluations.

4.4.2.1.1 Purpose.

The purpose of AT operational testing is to evaluate how well the ASR-11, while under various operating conditions, supports AT personnel in successfully performing their daily tasks.

4.4.2.1.2 Requirements Verified in This Test.

See appendix A for Requirements Detail
Requirement # - 21, 29, 47, 48, 53, 54, 55, 313, 314, 316-318, 463-466, 516, 646, 650, 651.1, 687, 745-746, 752-756, 761, 840, 841.1, 862, 877, 885-892, 904.

4.4.2.1.3 Test Objectives.

a. Verify the ASR-11 can provide terminal surveillance of aircraft in support of FAA ATC requirements at current and planned ATC facilities.

b. Verify the ASR-11 can provide detection of air carrier, military, air taxi, and general aviation aircraft in weather and anomalous propagation clutter and output accurate, reliable surveillance data to ATC facilities and provide six-level weather detection.

c. Verify the ASR-11 can meet all its performance requirements and continue to be usable to ATC in performing their daily job.

d. Verify the ASR-11 can automatically reconfigure to the redundant hot standby set of channels when BITE detects a fault in either the on-line, operational target or weather channel.

e. Verify the ASR-11 can provide reconstituted analog video and reformatted digital data from the DASR system in acceptable forms for use in the present ATC automation systems.

f. Verify the VDCU can provide the user interface to the video displays by providing user selectable parameters for both surveillance and weather.

g. Verify the ASR-11 VDCU display and indicators are clearly visible under all viewing angles and lighting conditions.

h. Verify the ASR-11 control panel includes all controls, switches, and indicators required for control and status functions as defined in the system specification paragraph 3.5.2.

i. Verify the ASR-11 control panel controls and indicators are clearly visible in the tower cab or TRACON lighting environments.

j. Verify the ASR-11 control panel have an aural alarm and comply with the best commercial practice human interface requirements.

k. Verify the depot response time is adequate and within reasonable limits for the AF Technician to perform his job.

4.4.2.1.4 Test Location.

Fourth Floor, Stockton Control Tower, Stockton, CA.

4.4.2.1.5 Test Configuration.

Testing will be conducted on a fully configured ASR-11 system, and will be tested at Stockton, CA. This configuration will include the use of an ARTS-IIE automation system set up for testing purposes on the fourth floor of the airport tower.

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4.4.2.1.6 Test Approach.

The first part of this test will be run using an ASR-11 in a normal operation scenario. Targets and weather of opportunities will be utilized for this test. This will allow the AT test team members the opportunity to evaluate the ASR-11 in a normal operating environment. The test will be run on an ARTS-IIE test system on the fourth floor of the Stockton, CA, Airport Tower. The fourth floor system in addition to targets and weather of opportunities are intended to expose the AT test team to realistic situations that they are likely to experience once the ASR-11 is deployed. The tests will evaluate the different user components of the system and concentrate on observing surveillance and weather data on the radar display, Video Display Control Unit (VDCU) and responding to system status on the RCP. The AT test team will be provided a set of questionnaires (see appendices B and D). The questionnaires will be structured such that they will address specific issues related to the radar's performance, interface (both human and machine), and operation. The AT test team member will be asked to answer each question based on their observations.

The second part of this test will be run utilizing both AT and AF personnel. The test will utilize a subset of faults tested during the M-Demo portion of the AF evaluation test, section 4.4.2.2. The faults selected will cause a channel switchover. This will allow both AT and AF test team members the opportunity to evaluate how well the ASR-11 built-in-test equipment detects a fault in either the on-line, operational target or weather channel and automatically reconfigures to the redundant hot standby set of channels. Targets and weather of opportunities will be utilized for this test. The test will be run on an ARTS-IIE test system on the fourth floor of the Stockton, CA, airport tower. The test will expose both AT and AF to a realistic nondestructive fault scenario that they will likely experience in the field. The test will evaluate how well the system allows both AT and AF to solve the problem as a team while ensuring minimal interruption of target and weather data to the automation system. In addition, the test will verify that the response time from the depot on various spare parts is adequate for the AF technician to get spares on a timely basis. The scenario will be developed to include several failures of spare parts

that have to be ordered from the depot. The time it takes from the AF Technician ordering the spare part from the depot to the time it arrives on site will be measured. The process will be the standard process in place for ordering depot parts. Once the time is documented the test team will analyze the results and determine the adequacy of the depot response. The AT and AF test team will be provided a set of questionnaires (see appendices B and C). The questionnaires will be structured such that they will address specific issues related to the radar's performance, interface, operation, built-in test/fault isolation, manuals, training, spares, and tools. The AT and AF test team members will be asked to answer each question based on their observation.

4.4.2.1.7 Data Analysis Methods.

AT and AF test team members will be asked to fill out questionnaires and document what they observed during the test. The questionnaires will be collected and utilized in the compilation of the test report.

4.4.2.1.8 Test Resources

a. ASR-11 Site – Stockton
b. ARTS-IIE – fourth floor of Stockton Airport Tower
c. Air Traffic Controllers (3)
d. Air Traffic Control Supervisors (1)
e. Trained ASR-11 AF Technicians (4)
f. Depot stocked with spare parts
g. Stopwatch

4.4.2.2 Functional Performance - AF Evaluations.

4.4.2.2.1 Purpose.

The purpose of AF operational testing is to evaluate how well the ASR-11 maintenance training and documentation, on site sparing scheme, and system status reporting supports AF personnel in maintaining the ASR-11 on a daily basis. In addition, the test will measure each injected non-destructive faults mean time to repair (MTTR). This information will then be utilized by the RMA subtest.

4.4.2.2.2 Requirements Verified in This Test.

See appendix A for Requirements Details
Requirement # - 22, 27.1, 29, 52, 79 - 84, 120 - 125, 127, 128 - 135, 158, 161, 162, 171 - 173, 181, 182, 191 - 202, 206, 208, 238, 247, 248, 286 - 288, 289, 290.1, 291.5, 291.6, 291.7, 291.8, 389 - 394, 397, 401, 402, 410, 412, 422, 423, 425, 439, 446, 450 - 453, 532, 535, 543, 550, 562 - 564, 557, 565.1, 580, 584, 591, 594, 595, 629, 635.1, 637, 638, 639, 646, 650, 651.1, 653.1, 656 - 658, 659.1, 660, 663, 664, 667, 668, 670 - 686, 688 - 696.1, 697 - 700, 702 - 708, 710 - 715, 718, 720 - 727, 729 - 731, 732.1, 732.2, 732.3, 732.4, 732.5, 732.6, 732.7, 733 - 738, 749 - 756, 760, 761, 767, 768, 768.1, 769, 770, 776, 793, 815 - 855, 877, 879, 882, 885 - 892, 894, 904

4.4.2.2.3 Test Objective.

a. Verify the ASR-11 can implement fault detection and isolation functions which can detect and isolate faults as defined below:

1. BIT/FI detection rates of 90 percent or greater to ambiguity group of three line replaceable units or less using automatic mode.

2. BIT/FI detection rates of 95 percent or greater to one Line Replacement Unit (LRU) using automatic or manual modes.

3. Troubleshooting using all available means can achieve 100 percent fault isolation capability for all failures not detected and fault isolated to a single LRU using BIT/FI.

b. Verify the ASR-11 MTTR is less than or equal to 30 minutes as tested in accordance with MIL-STD 470B.

c. Verify procedures and manuals were written clearly, accurate, and consistent with training for the technician to perform his duties.

d. Verify the scheduled preventive maintenance tasks are clearly identified and can be done with the ASR-11 in the operational state without degrading performance.

e. Verify the training provided to the technicians was adequate enough to maintain the ASR-11 system.

f. Verify the ASR-11 system spares are adequate and available to maintain the system.

g. Verify the ASR-11 maintenance tools identified in the manuals are available and adequate to perform all maintenance tasks.

h. Verify the ASR-11 system provides adequate information for the technician to certify the ASR-11 system for use by AT.

i. Verify the ASR-11 system provides sufficient adjustability of adaptation parameters to calibrate certification screens to an independent source.

j. Verify noise levels generated by the ASR-11 system equipment located in operational and equipment areas do not exceed Occupational Safety and Health Association (OSHA) and MIL-STD 1472 regulations.

k. Verify the availability of on-site spares is adequate for the AF technician to perform his job.

4.4.2.2.4 Test Location.

ASR-11 site, Stockton, CA

4.4.2.2.5 Test Configuration.

Testing will be conducted on a fully configured ASR-11 system, and will be tested at Stockton, CA. This configuration will include the use of an ARTS-IIE automation system set up for testing purposes on the fourth floor of the airport tower.

4.4.2.2.6 Test Approach.

4.4.2.2.6.1 Maintainability Demonstration Test.

This test will be run on a fully operational ASR-11 System in a normal environment. The test will be performed by AF technicians to detect, isolate, and correct injected nondestructive faults into the system. Several fault conditions will be injected during the test. The faults will range from single faults that only require replacing the failed LRU to faults that require the AF technician to utilize maintenance manuals to isolate and correct the problem. MTTR will be measured for each injected nondestructive fault and will be collected for use in the RMA subtest section. AF test team members will be provided a set of questionnaires (see appendices C and D). The questionnaires will be structured such that they address specific questions related to Built-In-Test/Fault Injection (BIT/FI), manuals, training, spares, and tools. AF test team members will be asked to answer based on what they observed.

4.4.2.2.6.2 System Maintenance Activities Test.

This test will be run on a fully operational ASR-11 System in a normal environment with the appropriate on-site spare part available. The test will verify that the AF technician has all the necessary documentation, tools and spares to perform his day-to-day maintenance activities on the ASR-11 system. The test will be conducted by the AF technician performing the specified maintenance actions included in the maintenance manuals. The test verifies that the on-site spares are available when a failure occurs on that specific part. The test scenario developed will include several failures of parts that are part of the on-site spare list. Any spare part that is unavailable will be documented. At the conclusion of the test, the test team will evaluate the adequacy of the on-site spares. Questionnaires will be distributed to each test team member (see appendices C and D). The questions will be structured such that they address specific questions related to manuals, scheduling, maintenance tasks, training, spares, tools, certification, noise, and lighting.

4.4.2.2.7 Data Analysis Methods.

AF test team members will be asked to fill out questionnaires and document what they observed during the test. The questionnaires will be collected and utilized in the compilation of the test report.

4.4.2.2.8 Test Resources.

a. ASR-11 Site - Stockton, including all on-site spares
b. ARTS IIE – fourth floor of Stockton Airport Tower
c. Trained ASR-11 AF Technicians (4)
d. Stopwatch

4.4.2.3 Reliability, Maintainability, Availability.

The ASR-11 system is required to have an inherent availability (Ai) of 0.99999 during its useful life of at least 20 years under mission operating conditions of 24 hours per day with downtime for corrective and preventive maintenance. The primary sources of evaluation data will be the Joint Reliability and Maintainability Evaluation Team (JRMET) database, simulated maintenance actions, and routine maintenance required during the test period.

4.4.2.3.1 Purpose.

Verify that the ASR-11 system (PME and facilities) meets the system reliability, maintainability, and availability requirements. Verify logistics in place to support maintenance of the ASR-11 system.

4.4.2.3.2 Requirement Verified in This Test.

See appendix A for Requirements Details
Requirement # 315, 742 - 744, 760, 761

4.4.2.3.3 Test Objectives.

a. Verify availability of ASR-11 System
b. Verify Mean Time Between Corrective Maintenance Action (MTBCMA)
c. Verify Mean Time Between Preventive Maintenance Action (MTBPMA)
d. Verify Mean Time To Repair (MTTR)
e. Verify Mean Time to Restore (MTR)
f. Verify Built-In Test/Fault Isolation (BIT/FI) requirements
g. Verify Technical Manuals
h. Verify support equipment

4.4.2.3.4 Test Location.

Fourth floor, Stockton Control Tower, Stockton, CA

4.4.2.3.5 Test Configuration.

Test will be conducted using the fully configured ASR-11 system at Stockton, CA.

4.4.2.3.6 Test Approach.

RMA data will be collected throughout the system test period to support the requirements verification. Previous test data and the JRMET database will be used to supplement this data, as applicable. In the event of an equipment failure trained AF personnel will be called to isolate and repair the fault. If preventive maintenance is required, it will be performed by the trained AF site personnel.

Simulated maintenance actions will be conducted for corrective and preventive maintenance actions. Preventive maintenance tasks will be selected from those maintenance actions not scheduled to be performed during the system test period. Trained AF site personnel will perform these maintenance actions and data will be collected and analyzed. A sampling of corrective maintenance tasks that are representative of the entire ASR-11 system maintenance will be selected. Corrective maintenance will be initiated by inserting and/or simulating an equipment failure in the ASR-11 system. Trained AF site personnel will perform these maintenance actions and data will be collected and analyzed.

4.4.2.3.7 Data Analysis Methods.

RMA data will be evaluated using the JRMET process.

4.4.2.3.8 Test Resources.

a. ASR-11 System – Stockton
b. JRMET database
c. PC

4.4.2.4 Site Adaptation and Optimization.

4.4.2.4.1 Purpose.

Ensure that the ASR-11 contains adequate functionality to allow for optimization of sites. Also, optimize the radar at Stockton in preparation for operational use.

4.4.2.4.2 Requirement Verified in This Test.

See appendix A for Requirements Details
Requirement # 313, 314, 319, 350 - 357, 357.1, 358 - 362, 366, 375, 418, 419, 430, 431, 437, 200, 202, 463, 511

4.4.2.4.3 Test Objectives.

a. Verify that the ASR-11 design allows optimization of system performance to local site conditions.

b. Verify that the ASR-11 can be optimized to meet PSR, MSSR, and weather operational requirements for good coverage and a low false alarm rate.

c. Verify that optimization procedures for the PSR, MSSR, weather channel, and SDT/DVG equipment are accurate and effective.

d. Verify that the PSR antenna pattern will allow adequate detection throughout the specified coverage volume.

e. Verify that the PSR and MSSR antennas can be properly tilted to provide for adequate coverage and a low false alarm rate.

f. Verify that mechanisms for alignment of the two ADGs and alignment to geographic north work properly.

g. Verify that the mechanisms for controlling false alarms in the PSR (e.g., STC, Plot Amplitude thresholding, plot blanking zones, track inhibit zones, low velocity editor) can be used effectively to optimize the system to operational needs.

h. Verify that the mechanisms for controlling MSSR false alarms (e.g., STC, permanent and dynamic reflector processing) can be used effectively to optimize the system to operational needs.

i. Verify that the ASR-11 provides sufficient information to the user to optimize and certify performance.

j. Verify that parameters used to control system performance operate effectively in optimization of the system.

4.4.2.4.4 Test Location.

Stockton

4.4.2.4.5 Test Configuration.

The ASR-11 will be equipped with a baselined latest hardware and software configuration. All system parameter settings and equipment settings (e.g., antenna tilt) will be recorded prior to execution of this test. During this test, the baseline configuration will be adjusted to provide optimized performance for the PSR, MSSR, and weather.

Throughout the optimization period, surveillance data will be recorded at the output of the local SCDIs, at the output of the SDT, and at the ARTS-IIE data extraction facility. Weather data will be recorded at the output of the local SCDIs and observed on the PPI displays on the fourth floor of the Stockton tower.

4.4.2.4.6 Test Approach.

ASR-11 optimization will be conducted by AOS-230, ACT-310, and the Air Force's 84th Radar Evaluation Squadron (RADES). Optimization of the radar will be coordinated with the users at Stockton to ensure that the optimized radar meets operational needs. The ability of the ASR-11 to be optimized and the effectiveness of optimization procedures will be evaluated. ASR-11 optimization must be successfully completed prior to conduct of system performance tests.

Antenna orientation will be established using a manual solar method. The RADES will perform this function. The solar method uses the known position of the sun at a given time to determine the antenna's azimuth and elevation response. Solar results will be used during azimuth and tilt alignment of the antenna. Solar data will also be compared with antenna data supplied by the contractor and will be considered during evaluation of detection throughout the coverage volume.

ADGs will be aligned to each other and to geographic north using contractor provided procedures. The ability to align the ADGs and the effectiveness of the procedures will be evaluated.

Critical system parameters for the PSR and MSSR will be measured and evaluated to ensure that these values are consistent with good detection within the coverage volume. Measurements of transmitter power, transmitter spectrum, Voltage Standing Wave Ratio (VSWR), PRF, MDS will be made using external test equipment. These measured values will be compared with values reported by the ASR-11 RMS to ensure that the radar can be adjusted to provide accurate information for use in certification.

The radar will be optimized to provide coverage that meets the operational needs of the user. Factors considered during coverage optimization include minimum and maximum range, azimuth and elevation angles (considering local site screening), areas with strong clutter, areas with road traffic, runway approach/departure, local routes and fixes, and handoff points.

Variable Site Parameters will be configured for optimum performance of the system. Optimum STC curves will be determined. The ability of the ASR-11 to handle static and changing conditions at the test site will also be evaluated. The effectiveness of false alarm control mechanisms (e.g., RAG zones, MSSR reflection processing using positions of permanent and dynamic reflectors, and AP filters) will be evaluated during the optimization process. Adjustability and effectiveness of tracker parameters will also be evaluated. Surveillance and weather data of opportunity will be recorded and analyzed to determine the effects of different combinations of VSP settings.

Based on the results from the Surveillance Accuracy tests, VSPs in the SDT will be adjusted to ensure that the reconstituted video slash always surrounds the real position of the aircraft. Sector mark delay VSPs will also be adjusted to ensure that target reports with maximum throughput delay are reliably displayed on the PPI.

4.4.2.4.7 Data Analysis Methods.

Solar data will be analyzed by the RADES.

Data recorded during optimization tests will be analyzed to ensure that the ASR-11 provides adequate PSR and MSSR coverage with an acceptably low false alarm rate. Data recorded at each point in the system will be analyzed using RBAT and IRES to ensure that coverage and false alarm requirements are met for the end-to-end system.

Detection and false alarm rates will be evaluated for the same data sets. Performance through areas of clutter, interference, weather, and anomalous propagation will be assessed. The location and strength of the clutter will be identified using the clutter maps recorded during the test. The location and strength of interference will be identified using the A-scope snapshots recorded during the test. The location and intensity of the weather will be identified using the recorded ASR-11 weather maps. The presence of anomalous propagation will be verified through inspection of the ASR-7 displays and NEXRAD information, if available.

Coverage in important areas (e.g., approach/departure areas, and handoff points) will be evaluated. Aircraft characteristics (relative size (i.e., commercial or general aviation and speed) will be considered during analysis of the data and subsequent optimization of the parameters.

Data will be analyzed separately for the plot and track data streams. The data will be tracked to separate real from potentially false reports. Real tracks will be distinguished from false tracks using characteristics such as minimum track life, percent of the radar beacon merged reports in the track, and minimum track speed. Potentially false reports will be further studied to determine the likely cause of the false report.

The effectiveness of the PSR and MSSR trackers will also be evaluated by filtering the data using the Raytheon track numbers. Crossing tracks, tracks over areas of known clutter and roads, and tracks through areas of known beacon reflections will be studied to ensure correct operation of the ASR-11 trackers.

The data will also be analyzed to ensure that the ASR-11 false alarm control mechanisms do not degrade detection performance.

a. PSR coverage performance will be measured with the RIS enabled.

b. PSR coverage performance will be measured in areas where plot amplitude thresholding is active. The times and locations of the plot amplitude thresholding will be determined through observations during the data recording.

c. PSR detection performance will be measured in areas where RAG zones have been set up (e.g., over roads or in areas of strong clutter).

d. Beacon detection performance will also be measured for aircraft flying through areas of known beacon reflectors. Recorded permanent and dynamic relfector files will identify the locations and orientation of the reflecting surfaces.

In addition to determining the overall false plot and false track counts per scan, the location of the false alarms will be studied. High concentration of false alarms in a critical area (such as an approach) may be an operational problem for AT, even if the overall number of false reports per scan is within specification limits.

4.4.2.4.8 Test Resources.

a. PC with network interface card and NetXRay Lan Sniffer software
b. ARTS-IIE with data extraction facility
c. RBAT
d. IRES
e. Power meter
f. Spectrum Analyzer
g. Noise meter
h. Counter
i. NEXRAD

4.4.2.5 Human Factors.

4.4.2.5.1 Purpose.

The purpose of the Human Factors Test is to assess the operational suitability of the ASR-11 principal interfaces. The test will be performed as part of the AT and AF evaluation subtests 4.4.2.1 and 4.4.2.2. The test will focus on the RCP, VDCU, and OMT.

4.4.2.5.2 Requirements Verified in This Test.

See appendix A for Requirements Detail
Requirement # - 48, 55, 198, 645, 646, 650, 651.1, 724, 767-770, 1024, 1045,1048, 1133, 1134, 1168, 1214, 1283

4.4.2.5.3 Test Objectives.

a. Verify that the RCP, the VDCU, and OMT human interfaces support the user in successful performance of daily tasks.

b. Verify that auditory alerts from the RCP and OMT support the user in performance of daily tasks and do not detract from this performance.

4.4.2.5.4 Test Location.

Fourth Floor, Stockton Control Tower, Stockton, CA.

4.4.2.5.5 Test Configuration.

Testing will be conducted on a fully configured ASR-11 system, and will be tested at Stockton, CA. This configuration will include the use of an ARTS-IIE automation system set up for testing purposes on the fourth floor of the airport tower.

4.4.2.5.6 Test Approach.

Testing will be conducted during both the AT and AF evaluation tests as defined in section 4.4.2.1 and 4.4.2.2. The Human Factors portion will be a subjective assessment of the human factors design of the various components of the system. It will address the human factors design of the RCP, VDCU, and OMT. AT and AF test team members will be provided a set of questionnaires (see appendix D). The questionnaires will be structured such that they will address specific questions related to the human factors design for the visual displays, auditory alerts, and data entry procedures. The questions were developed using the "Human Factors Checklist for the Design and Evaluation of Air Traffic Control Systems" developed by the John A. Volpe National Transportation System Center. The list has been tailored for the ASR-11 system. The test team members will be asked to answer each question based on their observations.

4.4.2.5.7 Data Analysis Methods.

AT and AF test team members will be asked to fill out questionnaires and document what they observed during the test. The questionnaires will be collected and utilized in the compilation of the test report.

4.4.2.5.8 Test Resources.

a. ASR-11 Site – Stockton
b. ARTS-IIE – fourth floor of Stockton Airport Tower
c. Air Traffic Controllers (3)
d. Air Traffic Control Supervisors (1)
e. Trained ASR-11 AF Technicians (4)

4.4.2.6 Safety.

4.4.2.6.1 Purpose.

The purpose of the Safety Test is to verify the ASR-11 system and facility provides a safe working environment in accordance with OSHA and NFPA standards.

4.4.2.6.2 Requirement Verified in This Test.

See appendix A for Requirements Details
Requirement # 246, 383-388, 403-407, 409, 410, 453, 652, 767-771, 784, 786, 787, 787.1, 818.1, 1018, 1024, 1037, 1045, 1046, 1048-1051, 1053-1056, 1087, 1089, 1091, 1100, 1106, 1107.1, 1133, 1134, 1167, 1168, 1175, 1181, 1182, 1192-1195, 1197, 1199, 1204, 1210, 1211, 1214, 1215, 1229, 1248, 1253, 1262, 1264, 1265, 1281.1, 1283, 1305, 1309, 1312, 1313, 1317, 1318, 1329, 1335, 1363, 1368, 1369, 1370

4.4.2.6.3 Test Objective.

a. Verify it is possible to disable ASR-11 transmitter output via a discrete line for safety purposes.

b. Verify a locking mechanism is provided to hold the antenna group stationary during a maintenance/replacement exercise.

c. Verify a pedestal drive safety switch is provided and disconnects all primary power from both drive assemblies inhibiting rotation when the set position is selected.

d. Verify noise levels generated by the system is maintained at a level consistent with current OSHA regulations, as specified in CFR Title 29, Part 1910.

e. Verify the ASR-11 system meets all radiation requirements for both x-ray radiation less than 2 milliroentgen per hour at all times in any areas where normal maintenance is performed both inside and outside cabinets and electromagnetic radiation does not exceed the permissible exposure limit specified in FAA order 3910.3A, Paragraph 33.

f. Verify equipment design for personnel safety shall be per OSHA as identified in Title 29, Part 1910 of the code of Federal Regulations.

g. Verify the ASR-11 system complies with the safety requirements stated in section 3.14 of the ASR-11 system specification.

h. Verify the RMS provides the alarms and alerts for the necessary safety control systems.

i. Verify the ASR-11 facility systems are built in accordance with the personnel safety requirements of CFR Title 29, Part 1910, Occupational Safety and Health Agency (OSHA) and National Fire Protection Association (NFPA) 70.

j. Verify all lighting provided by the ASR-11 both internal and external is in accordance with the requirements stated in section 3.5.6 of the ASR-11 Facility Requirements Document.

k. Verify a fire and smoke detection system is designed in accordance with NFPA 70 and NFPA 72 and integrated into all ASR-11 facilities.

l. Verify the HVAC does not contribute more than 65 dB (A) noise pressure to the aggregate ambient noise levels in the radar equipment room.

m. Verify the engine-generator is provided with a spark-ignited engine, conforming to NFPA 30 and NFPA 37.

n. Verify the tower is designed with OSHA-compliant access doors, stairs, work platforms, hoists, tie-off points and full body personnel harnesses where and as appropriate to provide access for maintenance and replacement of tower and antenna elements.

o. Verify all manufacturer's instructions relating to the use, maintenance, and safety requirements for batteries are provided at each site, in addition to any additional safety equipment recommended by OSHA or the manufacturer for the specific battery installed.

4.4.2.6.4 Test Location.

ASR-11 site, Stockton, CA, and Eglin Air Force Base, Eglin, FL.

4.4.2.6.5 Test Configuration.

Testing will be conducted on a fully configured ASR-11 system and will be tested at Stockton, CA. This configuration will include the use of an ARTS-IIE automation system set up for testing purposes on the fourth floor of the airport tower.

4.4.2.6.6 Test Approach.

The test will be conducted as a formal safety inspection of the ASR-11 site by the safety test team members. The inspection will focus on the requirements listed in section 4.4.2.7.2 and any outstanding safety issues from DT&E. Safety violations and hazardous conditions found will be documented on System Deficiency Reports (SDR) and prioritized as defined in section 5.8 of this plan.

4.4.2.6.7 Data Analysis Methods.

Safety test team members will be asked to fill out SDR for any safety violations and hazardous conditions found during the inspection. SDR will then be prioritized as defined in section 5.8 of this plan.

4.4.2.6.8 Test Resources.

a. ASR-11 Site - Stockton, CA
b. FAA safety representative - ANS-510 (3)

c. Radiation measurement equipment
d. Noise measurement equipment
e. Digital camera

4.4.2.7 Security.

4.4.2.7.1 Purpose.

The purpose of the security test is to verify the ASR-11 radar site facility provides the security features necessary to reduce the risk of loss or damage of Government property or impair the ability of the ASR-11 to fulfill its mission in the NAS.

4.4.2.7.2 Requirements Verified in This Test.

See appendix A for Requirements Details
Requirement # 818.1, 842, 843.1, 844.1, 844.2, 1028, 1029, 1031 - 1033, 1045, 1100, 1107, 1115, 1177, 1198, 1214, 1281.1, 1282, 1339 - 1342, 1356, 1357

4.4.2.7.3 Test Objective.

a. Verify that the RMS controls, and monitors ASR-11 system security alarms, alerts, and status.

b. Verify that the RMS provides the necessary security measures to protect the integrity of the ASR-11 system.

c. Verify control access to the RMS through an operator maintenance terminal or NIMS proxy agent is permitted only in response to a valid log-on procedure, based on a valid user ID in conjunction with a unique code word.

d. Verify all exterior doors are equipped with keyed lock sets, equipped with heavy duty cylindrical locks.

e. Verify four construction core master keys are provided for the site.

f. Verify each door is equipped with an "open door" alarm feature to permit remote monitoring.

g. Verify adequate lighting is provided in all areas of the ASR-11 for a secure environment.

h. Verify security fencing is provided around the perimeter of the ASR-11 site in accordance with FAA-E-2056 when necessary.

4.4.2.7.4 Test Location.

ASR-11 site, Stockton, CA.

4.4.2.7.5 Test Configuration.

Testing will be conducted on a fully configured ASR-11 system and will be tested at Stockton, CA. This configuration will include the use of an ARTS-IIE automation system set up for testing purposes on the fourth floor of the airport tower.

4.4.2.7.6 Test Approach.

A formal security inspection of the ASR-11 site by the security test team members will be conducted. The inspection will focus on the requirements listed in section 4.4.2.7.2, and any other security related issues raised as a result of the inspection. Security violations and hazardous conditions found will be documented on SDRs and provided as defined in section 5.8 of this plan.

4.4.2.7.7 Data Analysis Methods.

Security test team members will be asked to fill out SDRs for any security violations and hazardous conditions found during the inspection. SDRs will then be prioritized as defined in section 5.8 of this plan.

4.4.2.7.8 Test Resources.

a. ASR-11 Radar Site – Stockton
b. Digital camera

5. TEST MANAGEMENT.

5.1 TEST MANAGEMENT ORGANIZATION.

System Testing consisting of integration, suitability, and effectiveness testing is directed by the ASR-11 Functional Test Lead. The Test Lead is assigned to the Surveillance Branch (ACT-310) of the FAA William J. Hughes Technical Center Communication, Navigation and Surveillance Service (ACT-300).

5.1.1 Roles and Responsibilities.

ACT-310 as the lead organization for FAA operational testing will assign an ASR-11 Test Director. The Test Director is responsible for all planning, coordination, conduct, and reporting for the ASR-11 System Test. The Test Director will rely on support from various FAA organizations to successfully complete the ASR-11 System Test. The following organizations

will provide personnel with the specialized knowledge required in accomplishing each specific task:

a. ARN-300 - Provides ATC specialists to aid in evaluations of the ASR-11's operational effectiveness and suitability from an air traffic standpoint.

b. ARN-300 - Provides NAS maintenance technicians to aid in evaluations of the ASR-11's operational effectiveness and suitability from a maintenance standpoint.

c. AOS-200 - Support those portions of System Test that were formerly defined as Shakedown.

d. ACT-330 - Conduct NIMS interface testing.

e. AFR-304 - Evaluate logistics support capabilities.

f. AND-440/AOS-200 - Support for facilities subsystems and power testing.

g. ANS-500 - Support for facilities safety and security testing.

5.2 TRAINING.

The ASR-11 contractor will provide training for test personnel as required by the contract. The training program will be developed to provide for training course material and conduct for site-level Operation and Maintenance (O&M) training, system IOT&E training, and non-turnkey system installation. All training materials and course conduct will reflect the delivered ASR-11 system.

5.2.1 Test Developer Training.

Test developers will be attending the last 2 weeks of the IOT&E training course. The course will contain all the necessary information required for the Government to conduct testing. The training will be a 9-week course. The first 7 weeks will discuss Operations and Maintenance and the last 2 weeks will discuss IOT&E. The training course will be developed and conducted sufficiently in advance of scheduled Government testing.

In addition to the formal testing described above the test developers will be attending various system engineering technical interchange meetings, witnessing contractor testing, and performing on-the-job training during the development phase of the system. These activities will continue to provide information to the test developers necessary to perform their jobs.

5.2.2. Test Participant Training.

Test participants will be required to attend the IOT&E training course described in section 5.2.1. AF personnel participating in testing will be required to attend the ASR-11 maintenance training course. AT participants will be required to attend the AT training course.

5.2.3 Special Training Requirements.

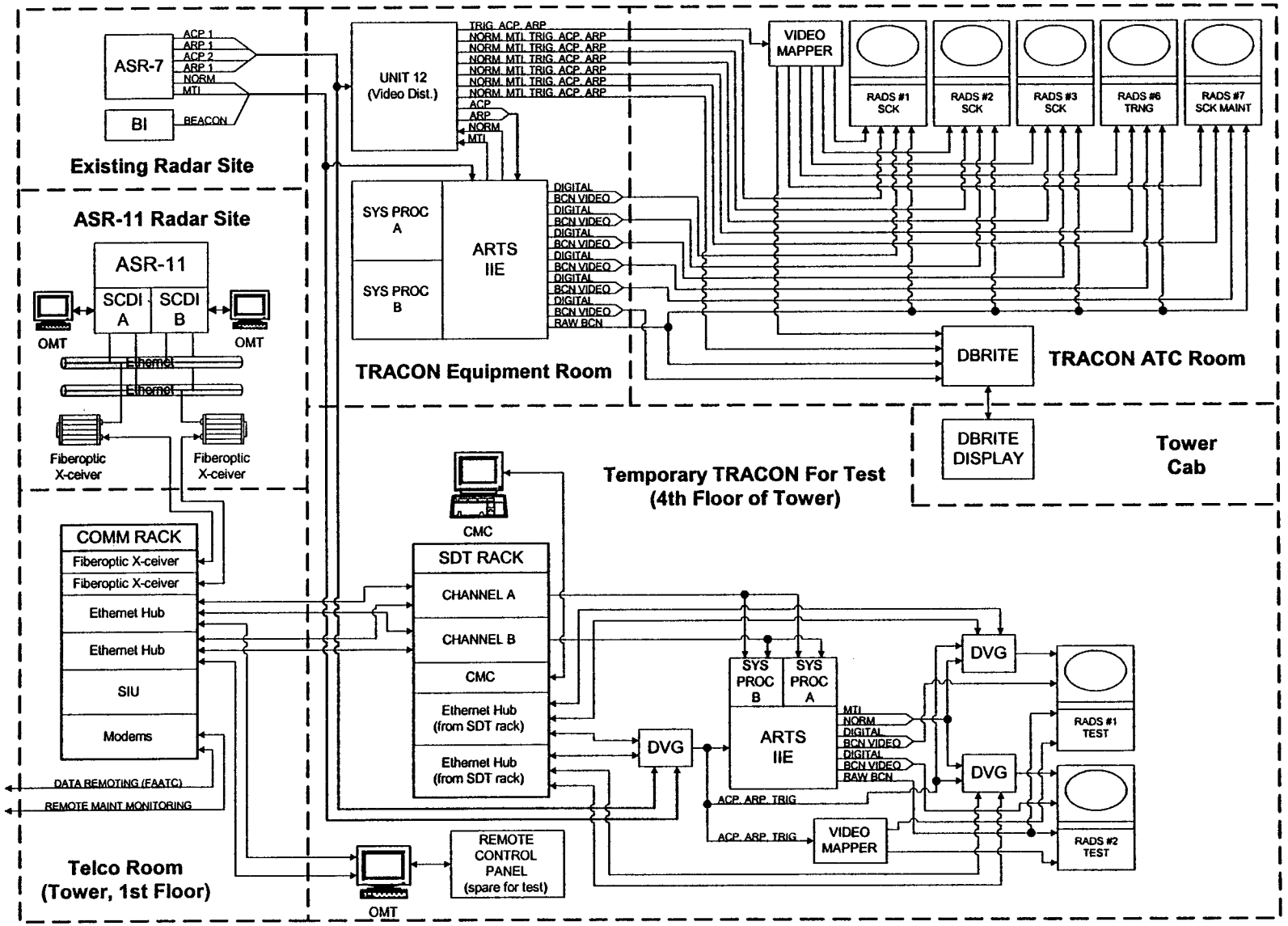
There are currently no special training requirements identified for the ASR-11.

5.3 SYSTEM CONFIGURATION MANAGEMENT.

ASR-11 system configuration will be optimized and baselined during the start of System Test. A configuration audit will be performed documenting the baseline configuration. Changes to the baseline (hardware and software) will be documented and any regression tests needed will be determined based on these changes. Customer and Raytheon adaptation parameters will be recorded daily and compared to an established baselined parameter set for correctness. The test director or an appointed representative will ensure configuration control is maintained throughout the conduct of System Test.

5.3.1 Testbed Configuration.

The testbed configuration used to perform OT at Stockton, CA, and the FAA William J. Hughes Technical Center is described in figure 5.3.1-1.



Stockton Configuration for System Test

FIGURE 5.3.1-1. TESTBED CONFIGURATION

5.4 OT ENTRY CRITERIA.

Entry into System Test is considered when the following prerequisites have been met:

a. Successful completion of Developmental Test (DT) as defined in the ASR-11 FAA Test and Evaluation Master Plan (TEMP).

b. Baselined, configuration-managed technical documentation, software, and hardware.

c. Completion of user training.

5.5 TEST CONDUCT.

System Test is split into two major areas; system integration tests and system operational tests. The test director assigns test team members to each area. The test director will notify the test members of their assignment and when the test is scheduled to begin. Each test is conducted as defined in the Test Approach sections of this document. Conduct of the test is under the direction of the test director or an appointed representative for each test. A Test and Evaluation Log is maintained during actual testing to record the start and end time of testing and anomalies, discrepancies that occurred, or deviations from procedures. The Test Director or an appointed representative is responsible for keeping the Test Evaluation Log and ensuring that events of the Log are properly recorded. A System Deficiency Report (SDR) form is used to document each discrepancy. (A sample SDR form is provided in appendix E.) At the conclusion of each test run, the Test Director or an appointed representative collects all printer output, magnetic tapes containing recorded data, Test and Evaluation logs, and SDRs.

5.6 SYSTEM TEST EXIT CRITERIA.

System Test is considered complete when the COIs listed below for Integration and Operational testing have been satisfied and all critical SDRs have been resolved.

5.6.1 System Test Integration.

The FAA NAS System Test Integration test effort will be considered complete when a determination has been made in regards to the system's ability to resolve COIs 1, 2, 3, 6, and 9 defined in section 4.1.2 of this document. Any critical system deficiencies which pertain to the Measure of Effectiveness (MOEs) for these COIs must be resolved and the corresponding MOEs must be successfully re-evaluated.

5.6.2 System Test Operational.

The FAA NAS System Test Operational test effort will be considered complete when a determination has been made in regards to the system's ability to resolve COIs 4, 5, 7, and 8 defined in section 4.1.2 of this document. Any critical system deficiencies which pertain to the Measure of Suitability (MOSs) and MOEs for these COIs must be resolved and the corresponding MOSs and MOEs must be successfully re-evaluated.

5.7 SYSTEM TEST REPORTS.

As required by the FAA Acquisition Management System, Test and Evaluation Process Guidelines, the following reports will be prepared to present the findings and analysis of System Test efforts:

The Quick Look Report will be submitted by the Test Director 1 week after completion of testing. The Final Report will be submitted by the Test Director 6 weeks after completion of testing.

The Quick Look Report will be prepared and submitted by the Test Director to present an early indication of the outcome of System Test. The Quick Look report will present preliminary analysis of test data highlighting test discrepancies and the significance of those discrepancies.

The Final Report will document the results of a detailed test analysis, assessing the conformance of each test to the objectives as described in each section of the Test Plan, and will provide the status of problems highlighted in the Quick Look Report. The Final Report will detail all problems and concerns found during testing, including an assessment of the impact of problems and recommendations for corrective action. Any new problems will be identified and the impact assessed. The Final Report will include all test descriptions, test results, conclusions, and recommendations

Discrepancies arising from unexpected results during testing will be noted in a SDR. SDRs will document failure during the execution of a test. SDRs will be signed by the originator and forwarded to the Test Director/Functional Test Lead for review.

5.8 SYSTEM DEFICIENCY REPORTS (SDR).

Discrepancies arising from unexpected results will be noted in a SDR. SDRs will document the failure during test execution. The SDR will be signed by the originator and forwarded to the Test Director for prioritization and review. SDRs will be categorized/prioritized in accordance with the definitions set forth in the DOD/FAA Joint Reliability Maintainability Evaluation Team (JRMET) charter for the DASR/ASR-11.

Once a category has been established for each SDR a sorting method will be used to prioritize each. Each report will be statused during the System Test by the Test Director. At the end of OT&E, the Test Director will compile a table summarizing the SDR's.

5.9 SYSTEM TEST SCHEDULE.

The integrated schedule for System Test is shown in figure 5.9-1.

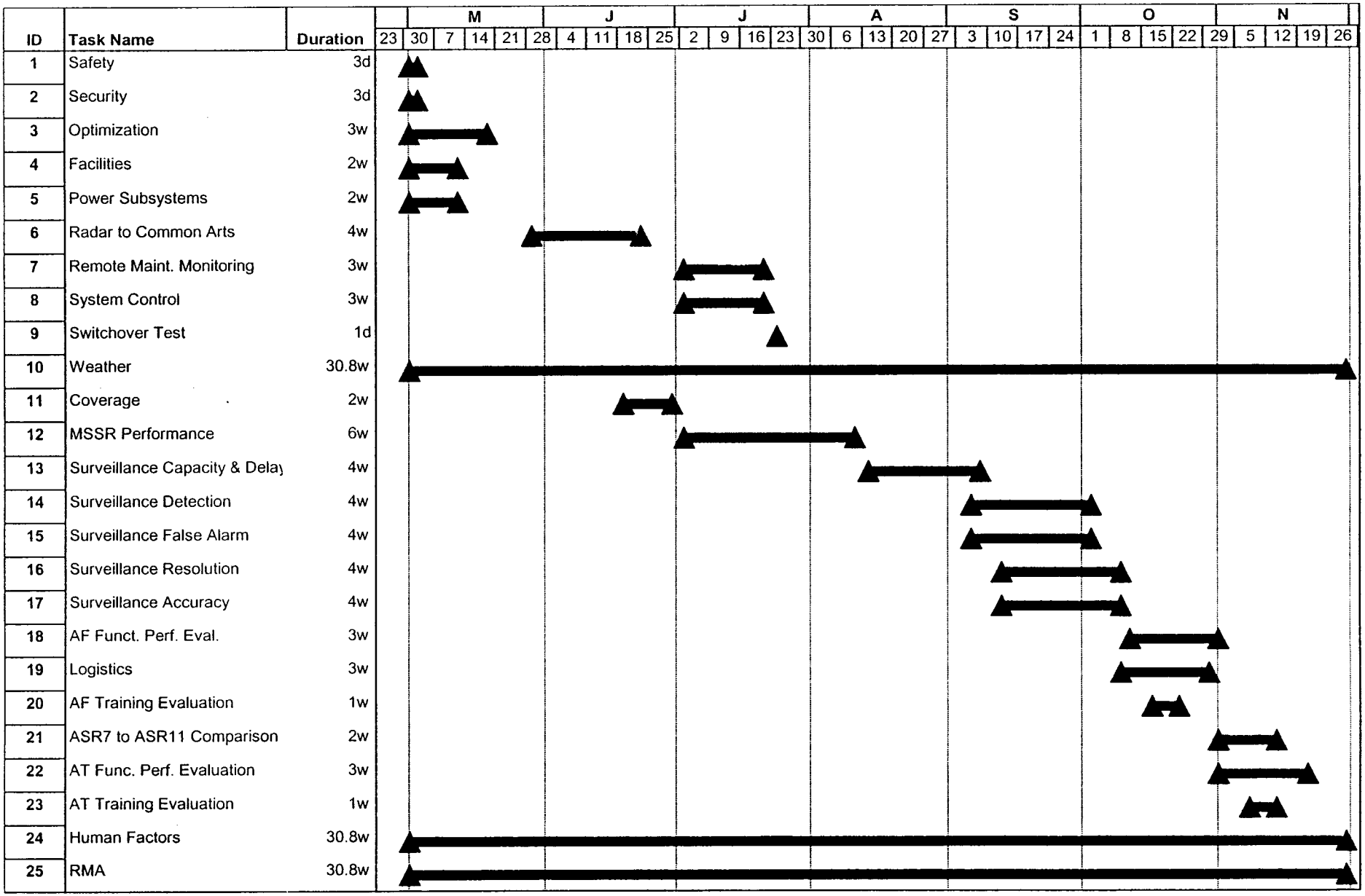


FIGURE 5.9-1. ASR-11 SYSTEM TEST SCHEDULE

5.10 PERSONNEL RESOURCE REQUIREMENTS.

The operational positions required and team members' roles in testing, as well as the organizations supplying personnel, are identified in this plan. The roles of test members are as follows:

Test Director or an appointed representative will be responsible for the scheduling of all on-site test activities and personnel.

Test Conductors will be responsible for the completion of a Test & Evaluation Log noting test start and end times, and any anomalies that occur during testing.

6. ACRONYMS AND GLOSSARY

Ai	Inherent Availability
AAF-1	FAA Airway Facilities Service
AC	Alternating Current
ACP	Azimuth Change Pulse
ACT-310	FAA Technical Center Surveillance Branch
ACT-330	FAA Technical Center Communication/Infrastructure Branch
ADG	Azimuth Data Generator
AF	Airways Facilities
AFB	Air Force Base
AFOTEC	United States Air Force Operational Test and Evaluation Command
AFR-304	FAA Surveillance Life-Cycle Division
AGL	Above Ground Level
AMS	Acquisition Management System
A/N	Alphanumerics
AND-440	FAA Surface Products Program Office
ANS-210	FAA NAS Implementation Management Division
ANS-500	FAA NAS Transition and Implementation, Environmental Energy and Safety Division
ANSI	American National Standards Institute
AOS	FAA Operational Support
AOS-230	FAA NAS Surveillance Systems Engineering Branch
AP	Anomalous Propagation
ARA-1	FAA Associate Administrator for Research and Acquisitions
ARIES	Aircraft Reply and Interference Environment Simulator
ARIG	Acquisition Reform Interim Guidance
ARP	Azimuth Reference Pulse
ARS	FAA Air Traffic Requirements Service
ARTS	Automated Radar Tracking System
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASTERIX	All Purpose Structured Eurocontrol Radar Information Exchange
ASR-8	Airport Surveillance Radar Model 8
ASR-11	Airport Surveillance Radar Model 11
ASU-230	FAA Office of Acquisitions Quality Assurance Branch
AT	Air Traffic
ATC	Air Traffic Control
ATCBI	Air Traffic Control Beacon Interrogator
ATCRBS	Air Traffic Control Radar Beacon System
ATCT	Air Traffic Control Tower
ATQ	FAA Office of Independent Operational Test and Evaluation
ATSTT	Air Traffic Services Test Team
ARN-100	FAA Air Traffic System Requirements Service Communications/ Navigation/Surveillance Branch

ATS-1	FAA Associate Administrator for Air Traffic Services
BEXR	Beacon Target Extractor Tool
BIT/FI	Built-In-Test/Fault Isolation
bps	bits per second
BRTQC	Beacon Real-Time Quality Control
C2-2	Modified Common Digitizer
CAI	Contract Acceptance Inspection
CD	Common Digitizer
CFAR	Constant False Alarm Rate
CFR	Code of Federal Regulations
CLIN	Contract Line Item Number
CM	Configuration Management
CMTP	Contractor's Master Test Plan
COI	Critical Operational Issue
COTS	Commercial Off-The-Shelf
CPP	Critical Performance Parameter
CSC	Critical System Characteristic
DAIR	Direct Altitude and Identity Readout
DASR	Digital Airport Surveillance Radar
dB	decibels
dBz	Weather Reflectivity Level in decibels
DBRITE	Digital Bright Radar Indicator Tower Equipment
DC	Direct Current
DDAS	Decoding Data Acquisition System
DOD	Department of Defense
DT	Developmental Test
DT&E	Developmental Test and Evaluation
DVG	Digital Video Generator
ECU	Environmental Control Unit
E/G	Engine/Generator
EIA	Electronics Industries Association
EMC	Electromagnetic Compatability
EMI	Electromagnetic Interference
EMP	Electromagnetic Pulse
EPA	Environmental Protection Agency
ESC	Electronic Systems Command
ESD	Electrostatic Discharge
FAA	Federal Aviation Administration
FAR	False Alarm Rate

FI	Fault Isolation
FaRD	Facilities Requirements Document
FMAC	Facilities Monitoring and Control
FRD	Facilities Requirement Document
FRUIT	False Replies Unsynchronized In Time
FY	Fiscal Year
GB&L	Grounding, Bonding, and Lightning
GFE	Government Furnished Equipment
GFP	Government Furnished Property
GHz	Gigahertz
GPS	Global Positioning System
HVAC	Heating, Ventilation, and Air Conditioning
IBI	Interim Beacon Interrogator
ICAO	International Civil Aviation Organization
ICD	Interface Control Document
IEEE	Institute of Electrical and Electronic Engineers
IOC	Initial Operational Capabilities
IOT&E	Independent Operational Test and Evaluation
IOTRD	Independent OT&E Readiness Declaration
IP	In-Plant
IPT	Integrated Product Team
IRD	Interface Requirements Document
IRES	Integrated Radar Evaluation System
JMTP	Joint Master Test Plan
JRMET	Joint Reliability Maintainability Evaluation Team
KDP	Key Decision Point
kn	knots
LAN	Local Area Network
LRU	Line Replacement Unit
MALA	Mode S/ASR-9 Line Adapter
MHz	megahertz
MIPS	Master Integrated Program Schedule
μEARTS	Micro-Enroute Automated Radar Tracking System
MOA	Memorandum Of Agreement
Mode S	Mode Select Beacon System
MOE	Measure Of Effectiveness
MOP	Measure Of Performance
MOS	Measure Of Suitability

MRSM	MSSR Remote System Monitor
MSSR	Monopulse Secondary Surveillance Radar
MTBCF	Mean Time Between Critical Failure
MBTCMA	Mean Time Between Corrective Maintenance Action
MTBF	Mean Time Between Failure
MTBPMA	Mean Time Between Preventative Maintenance Action
MTI	Moving Target Indicator
MTP	Master Test Plan
MTR	Mean Time to Restore
MTTR	Mean Time To Repair
NAS	National Airspace System
NCP	NAS Change Proposal
NDI	Non-Developmental Item
NEC	National Electric Code
NFPA	National Fire Protection Association
NIMS	NAS Infrastructure Management System
nmi	nautical mile
NTIA	National Telecommunications and Information Administration
NWS	National Weather Service
OCD	Operational Capabilities Demonstration
OMT	Operator Maintenance Terminal
ORD	Operational Requirements Document
OS	On-Site
OSHA	Occupational Safety and Health Administration
OSRD	On-site System Readiness Demonstration
OT&E	Operational Test and Evaluation
Pd	Probability of Detection
PFA	Probability of False Alarm
PARCS	Portable Autonomous Radar Collection System
PAT	Production Acceptance Test
PAT&E	Production Acceptance Test and Evaluation
PC	Personal Computer
PCS	Power Conditioning System
PIDP	Programmable Indicator Display Processor
PME	Prime Mission Equipment
PMR	Program Management Review
PPI	Planned Position Indicator
P3I	Pre-Planned Product Improvement
PRF	Pulse Repetition Frequency
PRP	Pulse Repetition Period
PSR	Primary Surveillance Radar

QA	Quality Assurance
QRO	Quality Reliability Officer
RADS	Radar Alphanumeric Display Subsystem
RAG	Range Azimuth Gate
RAM	Random Access Memory
RATCF	Radar Air Traffic Control Facility
RBAT	Radar Beacon Analysis Tool
RCP	Radar Control Panel
RCS	Radar Cross Section
RF	Radio Frequency
RFP	Request For Proposals
RMA	Reliability, Maintainability and Availability
RMMS	Remote Maintenance Monitoring System
RMS	Remote Monitoring Subsystem
rms	root mean square
RMSDT	Remote Monitoring Subsystem Design Tool
RTADS	Real-Time Aircraft Display System (Test Tool)
RTQC	Real-Time Quality Control
SAT	Site Acceptance Test
SCDI	Site Control and Data Interface
SCV	Subclutter Visibility
SDT	Surveillance Data Translator
SIU	System Interface Unit
SNR	Signal-to-Noise Ratio
SRAP	Sensor Receiver And Processor
SRD	System Requirements Document
SRTQC	Search Real-Time Quality Control
SS	System Specification
SSR	Secondary Surveillance Radar
STARS	Standard Terminal Automation Replacement System
STP	System Test Plan
T&E	Test and Evaluation
TBD	To Be Determined
TDSB	Test Data Scoring Board
TEMP	Test and Evaluation Master Plan
THD	Total Harmonic Distortion
TIM	Technical Interchange Meeting
TPRC	Test Policy Review Committee
TPWG	Test Planning Working Group
TRACON	Terminal Radar Approach Control
UDP	Universal Data Ports

UL	Universal Laboratories
UPS	Uninterruptable Power Supply
USAF	United States Air Force
VDCU	Video Display Control Unit
VRTM	Verification Requirements Traceability Matrix
VSP	Variable Site Parameters
VSWR	Voltage Standing Wave Ratio
46TS	United States Air Force 46th Test Squadron

APPENDIX A

VERIFICATION REQUIREMENTS TRACEABILITY MATRIX (VRTM)

VERIFICATION REQUIREMENTS TRACEABILITY MATRIX.

The OT&E portion of ASR-11 System Test will address verification of the requirements listed in the VRTM, table 2. Table 1, below, gives a description of the contents of each column in the VRTM.

Table 1. VRTM Column Definitions

Column	Heading	Content Description
1	REQ #	Provides a unique number for each requirement to facilitate tracking.
2	REQUIREMENTS paragraph ref	Identifies the paragraph number, if any, in which the requirement appears in pertinent program documents. The following abbreviations were used to indicate which document the associated paragraph number refers to: FRD Final Requirements Document SS System Specification (numbers following this abbreviation refer to Raytheon's shall notation) SRD System Requirements Document I NAS-SS-1000 Volume I II NAS-SS-1000 Volume II III NAS-SS-1000 Volume III
3	PERFORMANCE THRESHOLD	States requirements against which system performance will be assessed during OT&E.
4	OT&E - I	Marked if requirement is verified during Integration test.
5	OT&E - O	Marked if requirement is verified during Operational test.
6	SUBTEST PARAGRAPH	Identifies the paragraph(s) within this document which address the test(s) that will be performed to verify the requirement in column 3.
7	COI #	Correlates each requirement to the COI(s) under which it will be evaluated. COI numbers are derived from section 4.1.2 of this document.

VRTM

This appendix includes the COI OT requirements and NAS-SS-1000 requirements. The VRTM will indicate the specific tests (at the level described in the test plan) where each requirement is being addressed. Some of this information is already contained in the TEMP or JMTP.

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
0019.0	2.3 (SS-0019.0)	The MSSR shall be a dual-redundant channel Mode S upgradeable system with each channel configured in a single cabinet				
0020.0	2.3 (SS-0020.0)	The channel which is connected to the antenna for transmission shall receive reply signals from the antenna and provide full decoding, processing and target output for Mode 2, 3/A, and C targets				
0021.0	2.3 (SS-0021.0)	In the case of a fault in the operational channel, the standby channel shall be available as a hot standby to automatically take over system operation and ensure continuity of MSSR operation and data to the automation system(s)		X	4.4.2.1	6
0022.0	2.3 (SS-0022.0)	The MSSR output target reports and MSSR system status shall be provided to PSR site control and data interface units/operator maintenance terminals (SCDIs/OMTs) for combination with PSR reports and inclusion in summary site status, respectively	X	X	4.4.1.15 4.4.2.2	4 5
0025.0	2.5 (SS-0025.0)	The PSR shall provide correlated and uncorrelated search reports over the detection volume specified in 3.1.1 for combination with the MSSR/ beacon reports	X		4.4.1.8	1
0026.0	2.5 (SS-0026.0)	The combination of the PSR and MSSR/beacon reports shall be performed in dual redundant SCDIs/OMTs	X		4.4.1.15	4 5
0027.1	2.5 (SS-0027.1)	The SCDIs/OMTs shall also contain the RMS, which includes the site control and monitoring functions, operator interface and maintenance through dual-redundant terminals, interface to the NIMS proxy agent, interface to the local control panel, interface to remoting equipments for data remoting to automation sites, interface to the dual redundant local site facilities monitor and control (FMAC) units and surveillance/radar data displays to support maintenance activities	X	X	4.4.1.15 4.4.2.2	4 5
0028.0	2.5 (SS-0028.0)	The PSR shall be configured with dual-redundant receiver/exciter and signal processor channels for both target and weather				
0029.0	2.5 (SS-0029.0)	If internal built-in test equipment (BITE) detects a fault in either the online, operational target or weather channel, the PSR shall automatically reconfigure to the redundant hot standby set of channels to help ensure minimal interruption of target and weather data to the automation system	X	X	4.4.1.15 4.4.2.1 4.4.2.2	4 5 6
0030.0	2.5 (SS-0030.0)	The PSR shall also utilize a solid-state transmitter with dual-redundant drivers for fail-soft operation				
0034.0	2.8 (SS-0034.0)	The MRSM shall have dual-redundant channels				
0035.0	2.8 (SS-0035.0)	The MRSM shall provide continuous online performance monitoring of the MSSR system				
0036.0	2.8 (SS-0036.1)	The MRSM shall reply with preset codes to MSSR interrogations on Modes 3/A, B and C				

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
0037.0	2.8 (SS-0037.0)	It shall be possible to select either channel/transponder as the operational transponder with the non-selected channel always remaining in a standby mode for immediate operation	X		4.4.1.15	4 5
0038.0	2.8 (SS-0038.0)	If a failure is detected in the selected transponder, change over to the standby transponder shall be automatic	X		4.4.1.15	4 5
0040.0	2.8 (SS-0040.1)	The MRSM shall be level 1 Mode S upgradeable and will Level 4 Mode S replaceable				
0041.0	2.9 (SS-0041.0)	The MTI will employ a parabolic reflector and shall include a feed system which is responsive to frequencies in the range 2700 to 2900 MHz				
0042.0	2.9 (SS-0042.1)	The MTI phase-switching rate, phase variations and effective radar cross section in the frequency band shall allow the PSR to detect and process the reflected signal from selected MTI reflector positions within 6 nmi of the PSR position				
0043.0	2.9 (SS-0043.0)	The basic mechanical configuration shall include the mast, reflector, feed assembly and rechargeable battery with environmental enclosure				
0045.0	2.10 (SS-0045.0)	The SDT processor shall receive and process surveillance and weather reports from the ASR-11 and broadcast them to all DVGs	X		4.4.1.5 4.4.1.1 4.4.1.2	6 9
0046.0	2.10 (SS-0046.0)	Digital reports shall be sent to the local automation system (ARTS II, ARTS III) over dedicated interfaces	X		4.4.1.1 4.4.1.2	6
0047.0	2.10 (SS-0047.0)	The DVG shall reconstitute beacon, primary, weather and azimuth data to drive existing ATC display equipment	X	X	4.4.2.1 4.4.1.1 4.4.1.2	6
0048.0	2.10 (SS-0048.0)	The VDCU shall provide the user interface to the video displays by providing user selectable parameters to the DVG	X	X	4.4.1.1 4.4.1.2 4.4.1.15 4.4.2.1 4.4.2.5	4 5 6 8
0049.0	2.10 (SS-0049.0)	Single point switchover between the ASR-11 and existing radar equipments shall be via digital control from the SDT	X		4.4.1.1 4.4.1.2 4.4.1.18	4 6
0050.0	2.10 (SS-0050.0)	The SDT interface to the automation equipments shall be in accordance with ICD SE007-4 and the requirements of IRD "B" of the specification	X		4.4.1.1 4.4.1.2	6
0051.0	2.11 (SS-0051.0)	The ASR-11 equipments shall interface with the ARTS II, ARTS III, and DBRITE while providing the capability of interfacing to STARS as the existing automation equipments are replaced	X		4.4.1.1 4.4.1.2 4.4.1.3	6
0052.0	2.12 (SS-0052.1)	The remote OMTs shall provide the same maintenance capability as the local OMTs at the radar site, excluding the radar surveillance display functionality and VSP control/adjustment	X	X	4.4.1.15 4.4.2.2	4 5
0053.0	2.13 (SS-0053.0)	Each control panel shall consist of a switch panel and an interface circuit board mounted in an enclosure that can be console or wall-mounted		X	4.4.2.1	6

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0054.0	2.13 (SS-0054.0)	The layout of the control panel shall provide a control point field which includes a status indicator that indicates whether or not that location is currently in control of the system	X	X	4.4.1.15 4.4.2.1	4 5
0055.0	2.13 (SS-0055.0)	The panel control field shall provide subfields for indicating status of the panel operation, audio and lighting controls and a field associated with taking or relinquishing control of the system	X	X	4.4.1.15 4.4.2.1 4.4.2.5	4 5 8
0056.0	2.14 (SS-0056.0)	The ASR-11 external interface design shall accommodate the future STARS in accordance with paragraph 3.6.1 of the specification	X		4.4.1.3	6
0313.0	3.0 (SS-0313.0) 3.0 (SRD)	The ASR-11 shall provide terminal surveillance of aircraft in support of FAA and DOD ATC requirements at current and planned ATC facilities		X	4.4.2.1 4.4.2.4	1 2 3 5
0314.0	3.0 (SS-0314.0) 3.0 (SRD) 2.0 (ORD)	The system shall provide detection of air carrier, military, air taxi, and general aviation aircraft in ground, weather, and anomalous propagation clutter and output accurate, reliable surveillance (range and azimuth) data to ATC facilities, and provide six-level weather detection	X	X	4.4.1.8 4.4.2.1 4.4.2.4	1 2 3 4 5 6 9
0315.0	3.0 (SS-0315.0) 3.0 (SRD) 2.0 (ORD)	The system shall be capable of unmanned operation with a inherent system availability compatible with NAS requirements for critical systems		X	4.4.2.3	4
0316.0	3.1.1 (SS-0316.0) 3.1.1 (SRD) 3.a.1.a (ORD) 3.a.1.1 (ORD) 3.2.1.2.7.4 (NASI) 3.2.1.2.7.5 (NASI)	Slant Range: 0.5 - 60 nmi Azimuth: 360° Altitude: 0 - 24,000 feet AGL as limited by the elevation coverage requirement stated below Elevation: from local radar horizon as determined by earth curvature, atmospheric refraction, and as further limited by terrain screening to 30° with respect to the horizontal plane at the radar antenna Antenna Scan Rate: 4.8 +0.53 or -0.44 sec/rev Instrumented Range: 60 nmi	X	X	4.4.2.1 4.4.1.8 4.4.1.9	1
0317.0	3.1.2 (SS-0317.0) 3.1.2 (SRD) 3.a.1.b (ORD)	The PSR shall detect all aircraft within the detection volume with the following characteristics: RCS: 1 - 10,000 m^2 (linear polarization) Ground Speed: 25 - 700 knots	X	X	4.4.2.1 4.4.1.8 4.4.1.9	1
0318.0	3.1.3.1 (SS-0318.0) 3.1.3.1 (SRD) 3.a.1.g (ORD) 3.2.1.2.7.2 (NASI)	In the clear, the PSR shall detect a 1 m^2 Swerling 1 target anywhere within the detection volume with a single scan $P_d \geq 0.8$ at a P_{FA} of 10^{-6} over 92% of the radial velocities between -700 and +700 knots	X	X	4.4.2.1 4.4.1.8 4.4.1.9 4.4.1.10	1 2
0319.0	3.1.3.2 (SS-0319.0)	The PSR shall suppress combinations of fixed and moving clutter while detecting aircraft targets at all installed sites	X	X	4.4.1.8 4.4.1.9 4.4.1.10 4.4.2.4	1 2 5

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
0320.0	3.1.3.2 (SS-0320.3)	Within the target detection volume and with 7/8 transmitter modules operating, the PSR shall detect aircraft as specified in Figure 3-2 of the specification at the peak of the beam for a P_{FA} of 10^{-6} when subjected to clutter as defined in the applicable sections of the FAA ASR-11 Clutter Glossary	X		4.4.1.8 4.4.1.9 4.4.1.10	1 2
0321.0	3.1.3.3 (SS-0321.2)	The PSR shall meet performance requirements of sections 3.1.2, 3.1.3.1, 3.1.3.2, 3.1.4, 3.1.5, 3.1.6, 3.1.7, and 3.1.8 of the specification in the presence of pulse interference possessing the following characteristics: Peak Interference-to-Noise Ratio: ≤ 75 dB Pulsewidth: 0.5 to 4.5 μs PRF: 100 to 2000 pulses per second				
0322.0	3.1.3.4 (SS-0322.0)	The SDP shall provide detection of up to 25 MTI reflector returns and PEs, in any combination, which are operator selectable by a VSP, for display on the controller PPI and for monitoring of the PSR alignment				
0323.0	3.1.3.4 (SS-0323.0)	RAG windows, adjustable anywhere within the instrumented range of the radar, shall be provided for detection of PEs and MTI returns	X		4.4.1.15	4 5
0324.0	3.1.3.4 (SS-0324.0)	Selected PE/MTI returns shall be processed as true targets, but identified individually, such that they will not be eliminated by downstream processors				
0325.0	3.1.3.4 (SS-0325.2)	The capability to select or inhibit any or all PE/MTI returns shall be provided from the local and remote sites	X		4.4.1.15	4 5
0326.0	3.1.3.5 (SS-0326.0)	Scan-to-scan integration techniques utilizing an ACM shall be used to detect targets that would otherwise be lost due to tangential fading				
0327.0	3.1.3.5 (SS-0327.0)	The ACM shall provide selected constants to the Doppler filter for target detection				
0328.0	3.1.3.5 (SS-0328.0)	The ACM shall have an azimuth resolution of 1.4° and a range resolution of 1/16 nmi from 0.5 to 32 nmi and 1/2 nmi from 32 nmi to max range				
0329.0	3.1.3.6 (SS-0329.0)	CFAR techniques shall be provided to automatically adjust the threshold at the output of each Doppler filter such that the specified alarm probability ($P_{FA} = 10^{-6}$) is achieved	X		4.4.1.10	2
0330.0	3.1.4 (SS-0330.0) 3.1.4 (SRD) 3.a.1.c (ORD) 3.2.1.2.7.3 (NASI)	For an aircraft target with SNR ≥ 30 dB, including processing gain, the range error shall not exceed 275 feet RMS, including bias	X		4.4.1.12	3
0331.0	3.1.5 (SS-0331.0) 3.1.5 (SRD) 3.a.1.d (ORD) 3.2.1.2.7.3 (NASI)	For an aircraft target with SNR ≥ 30 dB including processing gain and at elevation angles 1° to 20° with respect to the horizontal plane at the radar site, the azimuth error shall not exceed 0.16° RMS, including bias	X		4.4.1.12	3

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0332.0	3.1.6 (SS-0332.0) 3.1.6 (SS) 3.a.1.e (ORD)	When returns are detected from two Swerling 1 targets, separated in range by at least 0.125 nmi, on the same azimuth, with the same or different radial velocities, and located at any point in the coverage volume, the PSR shall resolve the two targets and generate two unique target reports 80% of the time for any combination of RCS from 1 to 20 m^2 provided that the larger target's RCS is not more than 8 dB greater than the smaller target's RCS	X		4.4.1.11	3
0333.0	3.1.7 (SS-0333.0) 3.1.7 (SRD) 3.a.1.f (ORD)	When returns are detected from two Swerling 1 targets, separated in azimuth by 2.6°, at the same range, with the same or different radial velocities and located at any point in the coverage volume, the PSR shall resolve the two targets and generate two unique target reports 80% of the time for any combination of RCS from 1 to 20 m^2 provided that the larger target's RCS is not more than 8 dB greater than the smaller target's RCS	X		4.4.1.11	3
0334.0	3.1.8 (SS-0334.0)	The single scan probability of a split report shall be less than 0.75% for targets having an SNR ≥ 20 dB	X		4.4.1.10	2
0335.0	3.1.9 (SS-0335.0) 3.a.1.h (ORD)	Total system stability for both surveillance and weather functions, exclusive of scan modulation, shall be -55 dB (relative to carrier) or better at all ranges				
0336.0	3.1.10 (SS-0336.2) 3.1.10 (SRD) 3.a.1.i (ORD)	The average SCV of a non-fluctuating target shall be ≥ 42 dB under the following conditions: P_d: 0.5 P_{FA}: 10^{-6} Radial Velocities: 20 to 700 knots and -20 to -700 knots Range: 0.5 to 55 nmi Antenna Rotation: Nominally 4.8 sec/rev Clutter Type: Point clutter and distributed clutter				
0337.0	3.1.11 (SS-0337.1)	For a nominal long/short pulse transition range of 6.5 nmi, the peak range sidelobes shall be: a. at least 35 dB down from the peak of the compressed pulse for targets at ranges within 0.125 nmi of the long/short pulse transition range for dopplers from –700 knots to +700 knots, including the effects of STC over the uncompressed pulse length b. at least 40 dB down from the peak of the compressed pulse for targets beyond 0.125 nmi and out to 0.25 nmi of the long/short pulse transition range for dopplers from –700 knots to +700 knots, including the effects of STC over the uncompressed pulse length c. at least 45 dB down from the peak of the compressed pulse for targets beyond 0.25 nmi of the long/short pulse transition range for dopplers from -700 to +700 knots, including the effects of STC over the uncompressed pulse length				

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
0338.0	3.1.12 (SS-0338.1)	For a nominal short/long pulse transition range of 6.5 nmi the integrated range sidelobes shall be at least 32 dB below the compressed pulse mainlobe power, for dopplers from -85 to +85 knots, including the effects of STC over the uncompressed pulse length				
0339.0	3.1.13 (SS-0339.0) 3.1.13 (SRD) 3.a.1.j (ORD)	The PSR shall transmit in the frequency range of 2700 to 2900 MHz requiring no more than two frequency assignments within NTIA guidelines for radar emission bandwidth				
0340.0	3.1.14 (SS-0340.0)	PSR frequencies shall be factory- and site-selectable with a minimum resolution of 1 MHz, and be independently selectable				
0341.0	3.1.15 (SS-0341.0) 3.1.15 (SRD)	The PSR shall meet the requirements stated in Chapter 5, section 5.3.3, "Radar Spectrum Engineering Criteria," NTIA Manual of Regulations and Procedures for Federal Radio Frequency Management," (Title 47, Part 300 of CFR)				
0342.0	3.1.16 (SS-0342.0)	Pressurized dry air shall be used in all wave guide, air dielectric coaxial transmission circuits and rotary joint				
0343.0	3.1.16 (SS-0343.0)	No bottled gases shall be used				
0344.0	3.1.17.1 (SS-0344.0)	The PSR antenna shall be comprised of a doubly-curved reflector, fed at its focus by a dual-beam feed horn and polarization assembly				
0345.0	3.1.17.1 (SS-0345.0)	A test antenna, weather high/low beam switch, and polarization control switch shall be part of the antenna				
0346.0	3.1.17.1.1 (SS-0346.0)	The antenna shall operate at frequencies from 2.7 to 2.9 GHz				
0347.0	3.1.17.1.2 (SS-0347.0)	The dual-beam feed horn RF paths shall be capable of handling the following RF power levels: Low Beam Target: 80 dBm peak, 67 dBm avg High Beam Target and High/LowBeam Weather: +70 dBm peak, +60 dBm avg				
0348.0	3.1.17.1.3 (SS-0348.0)	The ICR for the low beam shall be ≥ 20 dB				
0349.0	3.1.17.1.3 (SS-0349.0)	The ICR for the high beam shall be ≥ 20 dB				
0350.0	3.1.17.1.4 (SS-0350.0)	The minimum gain, utilizing the low beam feed, when operating at any frequency between 2.7 and 2.9 GHz shall be 33.5 dB referenced to the input waveguide flange of the low beam feed		X	4.4.2.4	5
0351.0	3.1.17.1.4 (SS-0351.1)	Nominal gain, utilizing the low beam feed, when operating at any frequency between 2.7 and 2.9 GHz shall be 33.8 dB when averaged across the band 2700 MHz to 2900 MHz		X	4.4.2.4	5
0352.0	3.1.17.1.4 (SS-0352.1)	The minimum gain utilizing the high beam feed shall be 32.5 dB referenced to the coaxial interface of the high beam feed		X	4.4.2.4	5

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0353.0	3.1.17.1.4 (SS-0353.1)	The nominal gain utilizing the high beam feed shall be 32.8 dB when averaged across the band 2700 MHz to 2900 MHz		X	4.4.2.4	5
0354.0	3.1.17.1.5 (SS-0354.1)	The elevation pattern shall have a power distribution which exceeds the lower "spec limit" of ASR-8 Antenna elevation distribution as defined in FAA-E-2506 including amendment 4, 19 Nov. 1975		X	4.4.2.4	5
0355.0	3.1.17.1.5 (SS-0355.1)	The high beam peak shall have an uptilt relative to the low beam peak of +4°, ± 1°		X	4.4.2.4	5
0356.0	3.1.17.1.5 (SS-0356.1)	The elevation sidelobe level shall be more than -22 dB down (first sidelobe) for the low beam and -20 dB down for the high beam		X	4.4.2.4	5
0357.0	3.1.17.1.5 (SS-0357.0)	The elevation beamwidth shall be 4.8° minimum for both the high and low beams		X	4.4.2.4	5
0357.1	3.1.17.1.5 (SS-0357.1)	Roll off at the lower edge of the high and low beams shall be monotonic decreasing to 18 dB below beam peak with the angular separation between -3 dB (relative to the beam peak) and -18 dB less than 6°		X	4.4.2.4	5
0358.0	3.1.17.1.5 (SS-0358.0)	The 3 dB beamwidth of the low beam shall be 1.35° to 1.5°		X	4.4.2.4	5
0359.0	3.1.17.1.5 (SS-0359.0)	The 3 dB beamwidth of the high beam shall be 1.35° to 1.5°		X	4.4.2.4	5
0360.0	3.1.17.1.5 (SS-0360.0)	Azimuth sidelobes of the low beam shall be ≤ -24 dB below the low beam peak in the principal azimuth plane		X	4.4.2.4	5
0361.0	3.1.17.1.5 (SS-0361.0)	Azimuth sidelobes of the high beam shall be ≤ -22 dB below the high beam peak in the principal azimuth plane		X	4.4.2.4	5
0362.0	3.1.17.1.6 (SS-0362.0)	The median gain of the high and low beams, as defined in 5.3.3.5 of the NTIA manual, shall be less than or equal to -10 dB relative to an isotropic source measured in the principal azimuth planes		X	4.4.2.4	5
0363.0	3.1.17.1.7 (SS-0363.1)	A test antenna shall be provided insertable for measuring the transmitter output power and to permit circular polarization measurements				
0364.0	3.1.17.1.7 (SS-0364.0)	Test antenna characteristics shall be as follows: Operating Frequency Range: 2.7 to 2.9 GHz Polarization: Linear VSWR: 1.3:1 maximum Gain: 2 to 6 dB Power Handling: 1 W maximum				
0365.0	3.1.17.1.8 (SS-0365.0) 3.1.17.a (SRD) 3.a.1.k (ORD)	The PSR antenna shall be operator-selectable for either linear or circular polarization	X		4.4.1.15	4 5
0366.0	3.1.17.1.9 (SS-0366.2)	The antenna tilt of the main beam (low beam) shall be adjustable at the antenna so that the peak power point of the radiated beam can be set within 0.1° at any angle between 3° below the horizontal and 5° above the horizontal		X	4.4.2.4	5

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0367.0	3.1.17.1.9 (SS-0367.0)	A tilt indicator shall show the tilt of the maximum power point of the radiated beam to an accuracy of 0.2° at the center of the frequency band				
0368.0	3.1.17.1.9 (SS-0368.0)	Mechanical stops shall be provided to limit the travel of the reflector in the vertical plane at the upper and lower limits of the tilting mechanism				
0369.0	3.1.17.1.9 (SS-0369.0)	A positive lock at any tilt angle shall be provided				
0370.0	3.1.17.1.9 (SS-0370.0)	Provision shall be made to achieve antenna balancing to the specified tolerance at any combination of MSSR and PSR elevation tilt angles				
0371.0	3.1.17.1.9 (SS-0371.0)	Balancing shall be obtainable in any of the required tilt angle adjustments by use of counterweights				
0372.0	3.1.17.1.9 (SS-0372.0)	The imbalance tolerance due to the combined effect of dead weight and centrifugal moment about the pedestal bearing when rotating at 12.5 RPM shall by analysis not exceed 150 foot-pounds				
0373.0	3.1.17.1.9 (SS-0373.0)	The MSSR antenna mount shall have adjustment so that peaks of the PSR and MSSR antenna beams can be aligned in azimuth				
0374.0	3.1.17.1.9 (SS-0374.0)	Provision shall be made to permit access to all replaceable items such as the MSSR antenna, feed and polarizer with built-in ladders or equivalent				
0375.0	3.1.17.1.9 (SS-0375.0)	A means of checking the alignment of feed horns shall be provided		X	4.4.2.4	5
0376.0	3.1.17.1.10 (SS-0376.0)	The pedestal design shall be such that all pedestal requirements are met and maintained under any combination of service, environmental or operational condition described in the specification				
0378.0	3.1.17.1.10 (SS-0378.0)	The pedestal group shall provide continued operation even when the PSR and/or the MSSR are turned off or removed	X		4.4.1.15	4 5
0379.0	3.1.17.1.10 (SS-0379.0)	The pedestal group shall have dual drive assemblies and controllers and dual azimuth position data units				
0380.0	3.1.17.1.10 (SS-0380.0)	The pedestal group shall be able to support and rotate the PSR antenna and/or the MSSR antenna				
0381.0	3.1.17.1.10 (SS-0381.0)	The pedestal group shall have a slip ring assembly, a rotary joint assembly and all other items necessary for system operation				
0382.0	3.1.17.1.11 (SS-0382.0)	Two independent redundant drive systems shall be supplied on each pedestal				
0383.0	3.1.17.1.11 (SS-0383.0)	Under normal operating environmental conditions both motors shall be continuously operating		X	4.4.2.6	7
0384.0	3.1.17.1.11 (SS-0384.0)	In the event of a failure, it shall be possible to replace the failed drive unit without stopping antenna operation		X	4.4.2.6	7
0385.0	3.1.17.1.12 (SS-0385.0)	A hand crank or equivalent shall be provided to manually rotate the antenna group forward or backward		X	4.4.2.6	7

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0386.0	3.1.17.1.12 (SS-0386.0)	A locking mechanism shall be provided to hold the antenna group stationary during a maintenance/ replacement exercise		X	4.4.2.6	7
0387.0	3.1.17.1.12 (SS-0387.0)	It shall not be possible to apply power to the drive assemblies when the pedestal is locked	X	X	4.4.1.6 4.4.2.6	7
0388.0	3.1.17.1.12 (SS-0388.0)	An indication that the locking mechanism is engaged shall be provided on the OMT	X	X	4.4.1.6 4.4.2.6	7
0389.0	3.1.17.1.13 (SS-0389.0)	Gear boxes, azimuth bull/pinion gears, azimuth bearings and all turning gear elements shall be protected by an oil lubrication system		X	4.4.2.2	4
0390.0	3.1.17.1.13 (SS-0390.0)	Drain plugs and fill-overflow mechanisms shall be provided		X	4.4.2.2	4
0391.0	3.1.17.1.13 (SS-0391.0)	Lubrication shall not be required more frequently than twice each year of continuous operation		X	4.4.2.2	4
0392.0	3.1.17.1.13 (SS-0392.0)	Filling or draining oil from gear boxes shall be accomplished without the removal of the gear boxes		X	4.4.2.2	4
0393.0	3.1.17.1.13 (SS-0393.0)	Routine maintenance of the lubrication system shall be possible without shutting down the pedestal		X	4.4.2.2	4
0394.0	3.1.17.1.13 (SS-0394.0)	The pedestal shall be designed to preclude oil or grease from entering the rotating joint, slip ring assembly or waveguide		X	4.4.2.2	4
0395.0	3.1.17.1.14 (SS-0395.0)	Each antenna drive assembly shall have its own controller/starter including control power supplies, control/status interconnections and any other associated elements	X		4.4.1.6 4.4.1.15	4 5 7
0396.0	3.1.17.1.14 (SS-0396.0)	The pedestal controllers shall be located in the equipment shelter				
0397.0	3.1.17.1.14 (SS-0397.0)	Pedestal controller design shall be such that one drive assembly can be disconnected from service for maintenance without affecting the other drive assembly		X	4.4.2.2	4
0398.0	3.1.17.1.14 (SS-0398.0)	In the event of a failure, all power shall be automatically removed from the defective drive motor assembly				
0399.0	3.1.17.1.14 (SS-0399.0)	During antenna start, both drive motor assemblies, if serviceable, shall be engaged through a common "ON" function				
0400.0	3.1.17.1.14 (SS-0400.1)	It shall not be possible to stop the antenna while either the PSR or the MSSR are in operational mode from either the OMTs, the RCPs or NIMS	X		4.4.1.15	4 5
0401.0	3.1.17.1.14 (SS-0401.0)	Control of each drive motor shall be available at two places, either the pedestal local control panel located in the pedestal area or from the control and monitoring function	X	X	4.4.1.6 4.4.1.15 4.4.2.2	4 5
0402.0	3.1.17.1.14 (SS-0402.1)	Control points shall be interlocked to allow reapplication of power only from the point of control	X	X	4.4.1.6 4.4.1.15 4.4.2.2	4 5 7
0403.0	3.1.17.1.15 (SS-0403.0)	A pedestal drive safety switch shall be provided on the landing leading to the antenna platform	X	X	4.4.1.6 4.4.2.6	7
0404.0	3.1.17.1.15 (SS-0404.0)	The pedestal drive safety switch shall disconnect all primary power from both drive assemblies to inhibit rotation when the safe position is selected	X	X	4.4.1.6 4.4.2.6	7

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
0405.0	3.1.17.1.15 (SS-0405.0)	The pedestal drive safety switch shall inhibit the PSR and MSSR transmitters from radiating when the safe position is selected	X	X	4.4.1.6 4.4.1.15 4.4.2.6	4 5 7
0406.0	3.1.17.1.15 (SS-0406.0)	The pedestal drive safety switch shall be capable of being locked in the safe position with a padlock		X	4.4.2.6	7
0407.0	3.1.17.1.15 (SS-0407.0)	Appropriate status indication of the switch position shall be provided	X	X	4.4.1.6 4.4.1.15 4.4.2.6	4 5 7
0408.0	3.1.17.1.16 (SS-0408.0)	Access to the antenna platform shall be provided				
0409.0	3.1.17.1.16 (SS-0409.0)	An interlock having the same functions as the pedestal drive safety switch shall be provided on the access door/hatch	X	X	4.4.1.6 4.4.2.6	7
0410.0	3.1.17.1.16 (SS-0410.0)	A status indication of the interlock shall be provided	X	X	4.4.1.6 4.4.1.15 4.4.2.2 4.4.2.6	4 5 7
0411.0	3.1.17.1.17 (SS-0411.0)	The two ADGs shall be separately driven				
0412.0	3.1.17.1.17 (SS-0412.0)	Failure or removal for maintenance of any component of an ADG or its drive assembly shall not degrade the performance of the other ADG assembly		X	4.4.2.2	4
0413.0	3.1.17.1.17 (SS-0413.0)	The ADGs shall include optical encoders				
0414.0	3.1.17.1.17 (SS-0414.0)	Each ADG shall have its own power supply				
0415.0	3.1.17.1.17 (SS-0415.0)	The resolution of the optical encoders shall be 14 bits (16,384 parts of 360° of antenna rotation)				
0416.0	3.1.17.1.17 (SS-0416.1)	The RMS error between the reported antenna azimuth and the antenna boresight shall not be larger than 0.028°, including bias from either ADG				
0417.0	3.1.17.1.17 (SS-0417.0)	The relative azimuth alignment shall be monitored and the pass/fail result made available to the maintenance operator				
0418.0	3.1.17.1.17 (SS-0418.0)	Alignment of the dual ADGs to each other shall be accurate to two least significant azimuth increments (2 x 0.022°)		X	4.4.2.4	5
0419.0	3.1.17.1.17 (SS-0419.0)	An electronic adjustment mechanism shall be provided to allow alignment of the two ADGs and alignment to geographic (true) north		X	4.4.2.4	5
0420.0	3.1.17.1.17 (SS-0420.0)	The design of the ADG units and the routing of the ADG derived data shall ensure that azimuth accuracy is not adversely affected by transients				
0421.0	3.1.17.1.17 (SS-0421.0)	All online equipment shall utilize azimuth data from the same source				
0422.0	3.1.17.1.17 (SS-0422.0)	Buffering and interfacing shall be such that the failure of either ADG will not degrade the operation of the other		X	4.4.2.2	4
0423.0	3.1.17.1.17 (SS-0423.0)	Means shall be provided for automatic selection of the ADG units in the event of a failure and for manual override/selection		X	4.4.2.2	4

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0424.0	3.1.17.1.17 (SS-0424.0)	When PSR equipment which receives azimuth data is in maintenance mode, it shall be possible to select either ADG source as input				
0425.0	3.1.17.1.17 (SS-0425.0)	Adequate monitoring and readbacks shall be provided to isolate faults to the LRU level		X	4.4.2.2	4
0426.0	3.1.17.1.17 (SS-0426.0)	All modules except the ADG units and their power supplies shall be located in the radar equipment building				
0427.0	3.1.17.1.17 (SS-0427.0)	Each ADG unit shall be separately monitored and controlled				
0428.0	3.1.17.1.18 (SS-0428.0)	Azimuth data from each ADG shall be separately distributed to each channel of the PSR, MSSR, and to an optional port for an analog maintenance display				
0429.0	3.1.17.1.18 (SS-0429.0)	Redundant distribution networks shall be supplied from separate and individually controlled AC line inputs				
0430.0	3.1.17.1.19 (SS-0430.0)	A mechanical means shall be provided for indicating the azimuth position of the antenna beams		X	4.4.2.4	5
0431.0	3.1.17.1.19 (SS-0431.0)	The azimuth indicator unit shall have means of being aligned for any azimuth reading, regardless of the physical orientation of the pedestal base		X	4.4.2.4	5
0432.0	3.1.17.1.19 (SS-0432.0)	The indicator shall have permanent legible marks every degree				
0433.0	3.1.17.1.19 (SS-0433.0)	Markings shall be accented every 5° and numbered every 10°				
0434.0	3.1.17.1.20 (SS-0434.0)	Mechanical jacks, or wedges or similar devices shall be provided to level the antenna pedestal as installed on the pedestal mounting platform				
0435.0	3.1.17.1.20 (SS-0435.0)	Two accessible, mutually perpendicular liquid bubble levels shall be mounted on the rotating portion of the antenna pedestal				
0436.0	3.1.17.1.20 (SS-0436.0)	Frequent leveling and adjustments of the antenna, other than that required by settling of the facility foundation shall not be required				
0437.0	3.1.17.1.20 (SS-0437.0)	The leveling devices and bubble levels shall permit the azimuth axis of the pedestal to be aligned to earth center to within 0.01°		X	4.4.2.4	5
0438.0	3.1.17.1.21 (SS-0438.0)	The rotary joint/slip ring assembly shall be designed to mount within the antenna pedestal				
0439.0	3.1.17.1.21 (SS-0439.0)	The design shall permit routine maintenance of the slip ring and brush assembly without disassembly of the unit		X	4.4.2.2	4
0440.0	3.1.17.1.21 (SS-0440.0)	The rotary joint shall be weatherproof and dust tight				
0441.0	3.1.17.1.21 (SS-0441.0)	The rotary joint shall contain dynamic seals for pressurization of the high power RF channel				
0442.0	3.1.17.1.21 (SS-0442.0)	The pedestal shall support and rotate the rotary joint/slip ring assembly under the environmental conditions specified in section 3.8.1				

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0443.0	3.1.17.1.21.1 (SS-0443.1)	Electrical characteristics of the assembly shall be as specified below: Rotary Joint: 1. Type: Six channel 2. Channel 1: a) Frequency: 2700 to 2900 MHz b) Power Handling (1.5:1 Mismatch): 80 dBm max c) VSWR: 1.2:1 d) Insertion Loss: 0.15 dB 3. Channels 2 and 3: a) Frequency: 2700 to 2900 MHz b) Power Handling (2:1Mismatch): 66 dBm max c) VSWR: 1.35:1 d) Insertion Loss: 0.3 dB (ch 2) 0.65 dB (ch 3) 4. Channels 4 through 6: a) Frequency: 1010 to 1110 MHz b) Power Handling (2:1 Mismatch): 67 dBm peak, 56 dBm average (for 16 ms) and 50 dBm c) VSWR: 1.30:1 max d) Insertion Loss: 0.95 dBm max e) Interchannel Loss Tracking (4-5): 0.20 dB max over 360° f) Interchannel Phase Matching: 3° max over 360° 5. Cross-Channel Isolation: 60 dB min Slip Rings: 26-Way Dual Brushes, discrete ratings between 28V at 0.3A min to 250V at 15A max and with RS422A video signals to 5 MHz Rated at 5A, 250 VAC				
0444.0	3.1.17.1.21.2 (SS-0444.0)	The rotary joint shall have integral bearings				
0445.0	3.1.17.1.21.2 (SS-0445.0)	The rotary joint shall not depend on the pedestal for alignment of the choke joint				
0446.0	3.1.17.1.21.2 (SS-0446.0)	Design shall be modular and such that the failure of one path does not cause degradation of other paths		X	4.4.2.2	4
0447.0	3.1.17.1.21.2 (SS-0447.0)	The rotary joint shall be interfaced to the pedestal in such a manner that the alignment is simple and not critical				
0448.0	3.1.17.1.21.3 (SS-0448.0)	Cabling from the slip ring and brush assembly shall be brought out to water-tight connectors located on the antenna mount assembly				
0449.0	3.1.17.1.21.3 (SS-0449.0)	At least two spare slip rings shall be provided				
0450.0	3.1.17.1.22 (SS-0450.0)	The "Antenna Stop" control command shall only be available when the system is in maintenance mode	X	X	4.4.1.15 4.4.2.2	4 5 7
0451.0	3.1.17.1.22 (SS-0451.0)	The maintenance operator shall only be able to stop the antenna when the PSR and the SSR are in a maintenance role	X	X	4.4.1.15 4.4.2.2	4 5 7

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0452.0	3.1.17.1.22 (SS-0452.0)	The following control commands shall be available in both operational and maintenance role: a. Polarization linear/circular b. Select ADG X/Y for all azimuth data consumers c. Enable/disable automatic ADG reconfiguration d. Antenna start e. Motor 1 and 2 start/stop	X	X	4.4.1.15 4.4.2.2	4 5
0453.0	3.1.17.1.23 (SS-0453.0)	APG status, including the following shall be monitored: a. Lubricant oil level low indicator b. Driver motor over temperature c. Driver motor currents d. Lubricant oil over temperature e. Stow pin interlock status f. Driver motors on/off g. Wind speed h. Safety switch platform access	X	X	4.4.1.6 4.4.1.15 4.4.2.2 4.4.2.6	4 5 7
0059.0	3.1.18 (SS-0059.0)	A coherent-driven transmitter shall be provided				
0060.0	3.1.18 (SS-0060.0)	The transmitter shall be a solid-state, fault-tolerant design				
0061.0	3.1.18 (SS-0061.0)	If one of the eight output modules fails, the PSR shall meet its specification	X		4.4.1.8 4.4.1.9	1
0062.0	3.1.18 (SS-0062.0)	The RF drive level to the eight output modules of the transmitter group shall be adjustable by using a manual attenuator at the output of each driver				
0063.0	3.1.18 (SS-0063.0)	Switches shall be provided to permit each one of the eight output modules to be either independently or simultaneously switched from online to offline				
0064.0	3.1.18 (SS-0064.0)	The transmitter design shall contain eight power amplifier modules, two driver modules and associated power supplies				
0065.0	3.1.18 (SS-0065.0)	The amplifier power outputs shall be RF combined to provide the specified power output				
0066.0	3.1.18.1 (SS-0066.2)	The peak power of the transmitter shall be 18 kW minimum for the long pulse (measured at the midpoint of the pulse) and 19.5 kW minimum for the short pulse for the operational frequency of each radar	X		4.4.1.8 4.4.1.9	1
0067.0	3.1.18.1 (SS-0067.0)	The transmitter shall follow a nominal power law roll-off of $(N/8)^2$ as a function of N modules operating				
0068.0	3.1.18.1 (SS-0068.1)	This performance shall be achieved in the operational mode (cycling PRI)				
	3.1.18.1 (SS-0068.2)	When averaged over frequency, across the band 2700 to 2900 MHz, the peak power of the transmitter shall be 18 kW minimum for the long pulse and 19.5 kW minimum for the short pulse				
0069.0	3.1.18.2 (SS-0069.0)	Nominal input power to the driver modules shall be 20 mW				
0070.0	3.1.18.3 (SS-0070.0)	The transmitter shall have an instantaneously available bandwidth of 200 MHz (2700 to 2900 MHz)				

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0071.0	3.1.18.4 (SS-0071.1)	Integrated phase and amplitude noise caused by the transmitter shall be less than -60 dBc within a bandwidth of 1 MHz centered about the carrier				
0072.0	3.1.18.5 (SS-0072.2)	Pulsewidth of the transmitted short and long pulses shall be 1.45 μs ± 0.2 μs and 89 μs ± 4 μs	X		4.4.1.8 4.4.1.9	1
	3.1.18.5 (SS-0072.3)	Pulsewidths shall be 1 μs ± 0.2 μs and 89 μs ± 4 μs when measured at the output of the down converter				
0073.0	3.1.18.6 (SS-0073.0)	The transmitter shall accept a control signal which inhibits the RF output while the control signal is active	X		4.4.1.15	4 5
0074.0	3.1.18.6 (SS-0074.0)	Transmitter monitoring shall not be impaired by the operation of the RF blanking	X		4.4.1.15	4 5
0075.0	3.1.18.7 (SS-0075.0)	The transmitter shall include protection to prevent damage to the RF transistors in the event of a failure, or excessive pulsewidth, duty cycle or mismatch				
0076.0	3.1.18.7 (SS-0076.0)	Reset circuitry shall be used such that the transmitter can be reset when the protective circuits sense a pulsewidth or duty cycle malfunction				
0077.0	3.1.18.7 (SS-0077.0)	Resets (typically four times) shall not subject the transmitter to further damage due to a sustained malfunction				
0078.0	3.1.18.7 (SS-0078.0)	It shall be possible to turn on the transmitter manually following the reset action	X		4.4.1.15	4 5
0079.0	3.1.18.7 (SS-0079.0)	All failures shall be signaled to the operator and logged	X	X	4.4.1.15 4.4.2.2	4 5
0080.0	3.1.18.8 (SS-0080.0)	The transmitter shall have monitoring features so that maintenance can be performed rapidly and without special components such as high voltage probes, power meters, etc.		X	4.4.2.2	4
0081.0	3.1.18.8 (SS-0081.0)	The capability to monitor the peak power, pulsewidth and duty cycle shall be provided		X	4.4.2.2	4
0082.0	3.1.18.9 (SS-0082.0)	The transmitter shall have control mechanisms so that the transmitter can be controlled by the PSR CMS of the OMT	X	X	4.4.1.15 4.4.2.2	4 5
0083.0	3.1.18.9 (SS-0083.0)	Controls shall typically include transmit amplifier (1-8) RF on/off, emergency inhibit reset	X	X	4.4.1.15 4.4.2.2	4 5
0084.0	3.1.18.10 (SS-0084.0)	The transmitter shall interface to the microwave assembly, REX and SDP, interlock circuits and prime power so that all control and monitoring and performance requirements of the specification are met		X	4.4.2.2	4
0086.0	3.1.19.1 (SS-0086.0)	Four RF radar frequencies shall be available for selection under digital processor control				
0087.0	3.1.19.1 (SS-0087.0)	Each of the four RF frequencies shall be selectable in pairs within a two-frequency assignment in the radar band (2700 to 2900 MHz) for a given radar site				
0088.0	3.1.19.1 (SS-0088.0)	The exciter shall use a DWG to generate FM and CW waveform signals which are upconverted to RF and used for transmit and test signals				

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0089.0	3.1.19.1 (SS-0089.1)	The DWG shall provide the capability of generating a PROM programmable, 4 MHz, NLFM long pulse waveform and a PROM programmable CW short pulse waveform for the radar transmit signals and appropriate test signal waveforms for fault detection and isolation				
0090.0	3.1.19.1 (SS-0090.0)	The DWG shall use ROM-based digital waveforms with the desired FM which are D/A converted and upconverted to an IF				
0091.0	3.1.19.1 (SS-0091.0)	The IF waveform signals shall be converted to the desired S-band center frequencies to provide the transmit signals				
0093.0	3.1.19.2 (SS-0093.0)	Triple-downconversions shall be used to convert target and weather S-band signals to a third IF for direct A/D conversion				
0094.0	3.1.19.2 (SS-0094.0)	All front-end components shall have a dynamic range equal to or greater than that of the A/D converters				
0095.0	3.1.19.2 (SS-0095.0)	The receiver shall utilize digital controls available from the signal processor to adjust RF attenuators to keep strong target signals within the linear A/D dynamic range of the receiver at all times				
0096.0	3.1.19.2 (SS-0096.0)	The baseline Receiver/Exciter (REX) channel shall include a weather receiver				
0098.0	3.1.19.2 (SS-0098.0)	The weather receiver shall have RF, IF and video components with the same LRU part numbers as used in the target channel				
0098.1	3.1.19.2 (SS-0098.2)	The target and weather receivers shall meet the requirements of NTIA Chapter 5, paragraphs 5.3.3.8, 5.3.3.9 and 5.3.3.10, except with regard to paragraph 5.3.3.8, the receive bandwidth is matched to the transmit waveform				
0099.0	3.1.19.3 (SS-0099.2)	Integrated phase and amplitude noise caused by the exciter STALO shall be less than -60 dBc within a bandwidth of 2 MHz centered about the carrier				
0100.0	3.1.19.3 (SS-0100.1)	Integrated phase and amplitude noise caused by the exciter COHO shall be less than -70 dBc within a bandwidth of 1 MHz centered about the carrier				
0101.0	3.1.19.3 (SS-0101.0)	The combined effects of A/D clock jitter and A/D aperture jitter shall have an equivalent clutter cancellation ration less than -62 dBc				
0102.0	3.1.19.5 (SS-0102.0)	T/R limiters shall provide protection to the receiver from the transmitter to withstand the full peak power of the transmitter				
0103.0	3.1.19.5 (SS-0103.0)	Failure of one T/R limiter, or associated circuitry, shall not degrade operation of the other channel				
0104.0	3.1.19.6 (SS-0104.0)	Digital-controlled attenuators shall be implemented at RF on the receive paths to allow the signal processor the capability of adjusting the receiver gain				

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0105.0	3.1.19.6 (SS-0105.0)	Digital-controlled attenuation shall employ solid-state PIN diode attenuators, or the equivalent, inserted in the receiver path ahead of the RF amplifier(s)				
0106.0	3.1.19.6 (SS-0106.0)	At least 72 dB of range with a nominal LSB of 6 dB shall be provided				
0107.0	3.1.19.7 (SS-0107.0)	RF digital-controlled attenuator circuitry identical to that used in the target channel shall be provided as part of the weather receiver				
0108.0	3.1.19.8 (SS-0108.0)	An RF high/low antenna pattern selection switch shall be provided in the receiver				
0109.0	3.1.19.8 (SS-0109.0)	A high/low antenna digital control shall be provided by the SDP for selecting either the high or low antenna patterns				
0111.0	3.1.19.10 (SS-0111.0)	Low noise amplifiers (LNAs) shall be provided in both the target and weather receiver channels				
0112.0	3.1.19.10 (SS-0112.1)	Receiver channel LNAs shall operate across the total frequency band without adjustments				
0113.0	3.1.19.10 (SS-0113.2)	The receiver group shall have a noise figure performance over the entire operating frequency band which will be ≤ 2.9 dB when measured between the input of the receiver and the output of the down converter				
0114.0	3.1.19.11 (SS-0114.0)	Coherent I&Q phase detection shall be provided using a direct IF-to-digital conversion process				
0115.0	3.1.19.11 (SS-0115.0)	The final IF target and weather signal shall be sampled directly by the A/D converters				
0116.0	3.1.19.11 (SS-0116.0)	Post A/D digital processing shall be provided to produce I&Q serial data words				
0118.0	3.1.19.12 (SS-0118.2)	Nominal receiver dynamic range shall be 66 dB when measured from the RMS noise floor to the peak signal at the 3 dB compression point				
0119.0	3.1.19.12 (SS-0119.0)	All front-end components shall have a dynamic range equal to or greater than that of the A/D converters				
0120.0	3.1.19.13 (SS-0120.0)	REX hardware shall support fault monitoring, detection and isolation test routines that are executed in the SDP		X	4.4.2.2	4
0121.0	3.1.19.13 (SS-0121.0)	Online fault monitoring routines shall be used to detect receiver faults	X	X	4.4.1.15 4.4.2.2	4 5
0122.0	3.1.19.13 (SS-0122.0)	Offline fault isolation diagnostics and specific test routines shall be run sequentially under software control to isolate faulty modules to an LRU	X	X	4.4.1.15 4.4.2.2	4 5
0123.0	3.1.19.14 (SS-0123.0)	Online receiver fault monitoring and detection shall use RF S-band test signals which are injected after the low power T/R limiter of the target high beam and weather receive paths and after the high power T/R limiter in the target low beam receive path	X	X	4.4.1.15 4.4.2.2	4 5
0124.0	3.1.19.14 (SS-0124.0)	RF test signals shall be used to monitor continuity, gain, A/D noise level and stability of the target high and low beam and weather channel paths	X	X	4.4.1.15 4.4.2.2	4 5

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
0125.0	3.1.19.14 (SS-0125.0)	Provisions for online stability monitoring and fault detection shall use three RF diagnostic S-band test signals which are injected through a switch after the LNA into the downconverter of each receiver path		X	4.4.2.2	4
0126.0	3.1.19.14 (SS-0126.0)	The RF test signals shall be used to verify the combined REX and transmitter output FM/AM stability				
0127.0	3.1.19.15 (SS-0127.0)	Offline receiver fault isolation shall use RF S-band test signals which are injected into each receiver path or switched into the downconverter module after the LNA		X	4.4.2.2	4
0128.0	3.1.19.15 (SS-0128.0)	The RF test signals shall be used to isolate faults between the receiver microwave circuitry and target or weather downconverter modules		X	4.4.2.2	4
0129.0	3.1.19.15 (SS-0129.0)	Provisions for offline stability fault isolation shall use RF S-band test signals which are injected into each receiver path		X	4.4.2.2	4
0130.0	3.1.19.15 (SS-0130.0)	The RF test signals shall be used to verify stability of the microwave parts of the REX and to aid in the isolation of FM/AM stability faults between the REX, transmitter, and transmitter driver		X	4.4.2.2	4
0131.0	3.1.19.15 (SS-0131.0)	Offline REX fault isolation shall use several continuous and/or timed fault monitors in some LRUs which are summarized in the module to form one serviceable/failed latching fault status bit defining the status of the module		X	4.4.2.2	4
0132.0	3.1.19.15 (SS-0132.0)	A fault reset input shall be provided for resetting fault status	X	X	4.4.1.15 4.4.2.2	4 5
0133.0	3.1.19.15 (SS-0133.0)	REX fault status results, from these LRUs, shall be reported to the SDP individually over single-bit interfaces and will be used as the basis for fault isolation		X	4.4.2.2	4
0134.0	3.1.19.16 (SS-0134.0)	Buffered test outputs of signals shall be provided so that conventional test equipment can be used to diagnose faults in the receiver		X	4.4.2.2	4
0135.0	3.1.19.16 (SS-0135.0)	Normal operation of the PSR shall not be affected by the connection of test equipment to the test outputs		X	4.4.2.2	4
0136.0	3.1.19.17 (SS-0136.0)	The REX shall interface with the following equipment: a. Signal data processors b. Microwave assembly c. Transmitter d. AC power				
0137.0	3.1.19.18 (SS-0137.0)	RF cabling and waveguide components shall interconnect the solid-state transmitter, the target channel dual receiver/exciters, and the weather channel receivers to the antenna pedestal group via a six-channel rotary joint				

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0138.0	3.1.19.18.1 (SS-0138.0)	The following waveguide components shall be provided: a. Transmitter dual directional coupler with forward and reverse power monitor ports b. Harmonic absorber filter c. High power duplexing circulator d. Antenna dual directional coupler with forward and reverse power monitor ports e. Receiver transfer switch f. Receiver protector				
0139.0	3.1.19.19 (SS-0139.0)	The transmitter dual-directional coupler shall meet the following requirements: 1. Operating Frequency Range: 2.7 to 2.9 GHz 2. Coupling Values: a. Forward: 46 dB nominal b. Reverse: 50 dB nominal c. Coupling Variation Over Frequency: ±0.5 dB 3. Power Handling Main Arm: 3.2 kW average, 30 kW peak 5. Insertion Loss: 0.1 dB max (main arm)				
0140.0	3.1.19.19 (SS-0140.0)	With all unused ports of the transmitter dual-directional coupler terminated in matched loads, the VSWR shall be as follows: a. Input Port: 1.15:1 max b. Output Port: 1.15:1 max c. Forward Power Monitor Port: 1.25:1 max d. Reverse Power Monitor Port: 1.25:1 max				
0141.0	3.1.19.20 (SS-0141.0)	The harmonic absorption filter shall meet the following requirements: 1. Frequency Range: 2.7 to 2.9 GHz 2. Power Handling: 30 kW peak max, 3.2 kW avg 3. Passband Attenuation: 0.12 dB max 4. Stop-band Attenuation: 29 dB at second harmonic 5. VSWR: ≤1.2:1 in passband frequency range				
0142.0	3.1.19.21 (SS-0142.0)	The high-power circulator shall be a waveguide structure and provide the duplexing for the transmit and receive functions of the low-beam high-power channel				
0143.0	3.1.19.21 (SS-0143.0)	The high-power circulator shall meet the following functional requirements: 1. Frequency Range: 2.7 to 2.9 GHz 2. Power Handling: 30 kW peak max, 3.2 kW avg 3. Insertion Loss: Insertion loss from any input power to corresponding circulated output port, 0.25 max 4. Isolation: Isolation from any input port to corresponding isolated port, 20 dB min 5. VSWR: 1.25:1 max with all unused ports terminated in matched loads				

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0144.0	3.1.19.22 (SS-0144.0)	The antenna dual-directional coupler shall meet the following requirements: 1. Frequency Range: 2.7 to 2.9 GHz 2. Power Handling: 30 kW peak max, 3.2 kW avg 3. Coupling Values: a. Forward: 46 dB nominal b. Reverse: 50 dB nominal 4. Calibration: Permanently marked on each coupler 5. Coupling Variation Over Frequency Range: ±0.5 dB 6. VSWR: Measured with all unused ports terminated in matched loads a. Input Port: 1.15:1 max b. Output Port: 1.15:1 max c: Forward Power Monitor Port: 1.25:1 max d. Reverse Power Monitor Port: 1.25:1 max 7. Insertion Loss: 0.1 dB max, main arm				
0145.0	3.1.19.23 (SS-0145.0)	The low-beam high-power receive transfer switch shall meet the following requirements: 1. Frequency Range: 2.7 to 2.9 GHz 2. Power Handling: 30 kW peak max, 3.2 kW avg 3. Isolation: 70 dB min between the selected through-path and unused path 4. VSWR: 1.2:1 max for each through-path state with a matched load at throughput 5. Insertion Loss: <0.1 dB for each through-path state 6. Switching Speed: ≤300 ms 7. Switching Voltage: +22 to +32 Vdc 8. Switching Current: 2.0 A max at +28 Vdc 9. Monitoring and Control Signals: Conducted via a single multi-pin connector, each switched state capable of being indicated remotely using contact closures				
0146.0	3.1.19.24 (SS-0146.0)	The receiver protector shall be designed to protect the receiver against damage from transmitter pulses during normal and abnormal conditions of reflected power and leakage				
0147.0	3.1.19.24 (SS-0147.0)	The receiver protector shall be designed to prevent damage and overload due to signals from non-synchronized sources				
0148.0	3.1.20 (SS-0148.0)	Pulse compression shall be supplied for both the target and weather input signals				
0149.0	3.1.20 (SS-0149.0)	Target processing shall consist of Doppler filtering, Constant False Alarm Rate (CFAR) detection thresholding, dwell-to-dwell binary integration, clutter merge, adaptive clutter map, adaptive RF attenuation and beam selection controls, plot extraction, and scan-to-scan tracking				
0150.0	3.1.20 (SS-0150.0)	Weather processing shall consist of clutter (first and multiple times around) rejection, rejection of AP (first and second time around), map generation, and contour thresholding				

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
0151.0	3.1.21 (SS-0151.0)	The SDP shall develop and update an adaptive clutter map using the output of a zero velocity filter				
0152.0	3.1.21 (SS-0152.0)	Finite Impulse Response Doppler filters shall be provided which are tuned to different clutter conditions to meet SCV requirements of 3.1.10				
0153.0	3.1.21 (SS-0153.0)	The SDP shall declare alarms by filter and by range to the binary integrator				
0154.0	3.1.21 (SS-0154.0)	Detections out of the binary integrator (including, range, azimuth, amplitude and filter number) shall be transmitted to the plot processor				
0155.0	3.1.21 (SS-0155.2)	The baseline SDP shall include a five-pulse (CPI) digital MTD with the following characteristics: a. Five-pulse CPI timing generated by the synchronizer b. Five Doppler filters for target processing c. Range cell averaging CFAR circuit to filter the outputs of all five Doppler filters d. Highest amplitude filter output reported by merging all Doppler filter outputs e. M of N detection (2 of 4 CPIs) f. Adaptive STC and clutter maps g. Permanent echo adaptation data (location and gate size) h. AP reference cell i. Site preprogrammed maps: 1. Target beam/STC maps 2. Weather beam/STC maps				
0156.0	3.1.21 (SS-0156.1)	Resolution of the target/ weather STC and beam maps shall be 1/16 nmi to the end of the short pulse region and 1/2 nmi beyond				
0157.0	3.1.21 (SS-0157.0)	The SDP shall be designed with PRF staggering to avoid MTD blind speeds between 25 and 700 knots				
0158.0	3.1.21.1 (SS-0158.0)	The SDP shall have appropriate control mechanisms so that the SDP can be controlled by the PSR control and monitoring system	X	X	4.4.1.15 4.4.2.2	4 5
0159.0	3.1.21.1 (SS-0159.0)	The following control commands shall be available in the maintenance role: a. Start/stop signal processing b. REX data stream (either REX A or REX B) c. Clutter map selections (freeze, reset, rapid store) d. Target STC selections (pre-programmed, off, clear) e. Weather STC selections (pre-programmed, off) f. Target and weather beam selections (high, low, auto – pre-programmed) g. Frequency selections (agile, fixed) h. Permanent echoes on/off	X		4.4.1.15	4 5

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0160.0	3.1.21.1 (SS-0160.0)	The following control commands shall be available in the online and maintenance roles: a. Target and weather pre-programmed STC map selections (PPM1, PPM2, PPM-3) b. Adaptive range filters (on/off) c. Adaptive azimuth filters (AP fix) (on/off)	X		4.4.1.15	4 5
0161.0	3.1.21.2 (SS-0161.0)	The SDP shall provide status indications for all online and maintenance role controls	X	X	4.4.1.15 4.4.2.2	4 5
0162.0	3.1.21.2 (SS-0162.0)	The following status indications shall also be provided: a. SDP serviceable/failed b. End-to-end test pass/failed c. A/D saturation d. Azimuth data source serviceable/failed	X	X	4.4.1.15 4.4.2.2	4 5
0163.0	3.1.22 (SS-0163.0)	The clock for the synchronizer shall be the radar clock from the REX				
0164.0	3.1.22 (SS-0164.0)	To eliminate the effects of REX-to-REX RF interference, the two channels shall be synchronized via frame start pulses passed between the channels				
0165.0	3.1.22 (SS-0165.0)	Each SDP shall process either its own REX data or that of the other channel				
0166.0	3.1.23 (SS-0166.0)	The PSR shall be designed so that it provides the specified performance at all times without any manual intervention				
0167.0	3.1.23 (SS-0167.0)	Adaptive mechanisms provided in the PSR shall include: a. Adaptive clutter map b. Adaptive STC control to automatically ensure linear system operation c. Adaptive Doppler filter sets to minimize filter loss d. Adaptive amplitude thresholding to reduce bird detections				
0168.0	3.1.24 (SS-0168.2)	The time required for the PSR group to be fully operational from initial start shall be no more than 7 minutes for the PSR electronics in a controlled environment within the equipment housing	X		4.4.1.15	4 5
0169.0	3.1.24 (SS-0169.0)	After having been initiated, the turn-on procedure shall be automatic				
0170.0	3.1.24 (SS-0170.0)	The automatic turn-on procedure requirement shall be met in any order or regime of turn-on sequences				
0171.0	3.1.24 (SS-0171.0)	A power-up diagnostic test sequence shall be performed to determine the status of the PSR group		X	4.4.2.2	4
0172.0	3.1.24 (SS-0172.0)	Failure of any of the power-up tests shall result in the failed channel assuming the maintenance role and the failed state		X	4.4.2.2	4
0173.0	3.1.24 (SS-0173.0)	An indication of failure for any power-up test shall be provided to the RMS	X	X	4.4.1.15 4.4.2.2	4 5
0174.0	3.1.25 (SS-0174.0)	On detection of a failure condition in a PSR channel, the PSR channel shall be declared failed				

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
0175.0	3.1.25 (SS-0175.0)	If the PSR channel is in online selected role with the alternate channel in an online standby role, and if automatic reconfiguration is enabled, the failed channel shall assume the maintenance role	X		4.4.1.15	4 5
0176.0	3.1.25 (SS-0176.0)	If the PSR channel is in online selected role with the alternate channel in an online standby role, and if automatic reconfiguration is enabled, in the event of a channel failure, the alternate channel shall assume, or remain in, the online selected role	X		4.4.1.15	4 5
0177.0	3.1.25 (SS-0177.0)	If automatic reconfiguration is disabled then a failed PSR channel shall not reconfigure to the maintenance role	X		4.4.1.15	4 5
0178.0	3.1.25 (SS-0178.0)	If there is no online standby channel available then an online selected PSR channel shall not reconfigure to Maintenance in the event of detection of a failure	X		4.4.1.15	4 5
0179.0	3.1.25 (SS-0179.0)	Current adaptive clutter map and adaptive STC maps shall be maintained by the online standby PSR channel in order to minimize the loss of data or generation of false reports to the end user in the event of a reconfiguration				
0180.0	3.1.25 (SS-0180.0)	Equipment control selections issued to the online selected PSR channel shall be duplicated in the online standby PSR channel such that the equipment configuration is maintained in the event of a reconfiguration				
0181.0	3.1.25 (SS-0181.0)	FI routines shall be performed automatically on the failed equipment in the event of an automatic reconfiguration		X	4.4.2.2	4
0182.0	3.1.25 (SS-0182.0)	FI test results shall be provided to the RMS	X	X	4.4.1.15 4.4.2.2	4 5
0183.0	3.1.26 (SS-0183.0)	Only one PSR channel shall be in the selected mode at a given time				
0184.0	3.1.26 (SS-0184.0)	It shall be an invalid state for two online PSR channels to be in the standby mode at the same time	X		4.4.1.15	4 5
0185.0	3.1.26 (SS-0185.0)	Only operational commands shall be actioned by PSR channels in the online role	X		4.4.1.15	4 5
0186.0	3.1.26 (SS-0186.0)	Operational and maintenance commands shall be actioned by PSR channels functioning in the maintenance role	X		4.4.1.15	4 5
0187.0	3.1.26 (SS-0187.0)	The PSR channels shall accept commands from the OMT within the selected SCDI	X		4.4.1.15	4 5
0188.0	3.1.26 (SS-0188.0)	The PSR channels shall provide status reports to both SCDIs	X		4.4.1.15	4 5
0189.0	3.1.27.1 (SS-0189.0)	The following commands shall be available in the maintenance role (REX/SDP pop-up menu): a. Transition-to-Online Selected b. Transition-to-Online Standby c. Run Fault Isolation Tests d. Run End-to-End Tests e. Run Stability Tests f. Detailed subsystem status	X		4.4.1.15	4 5

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0190.0	3.1.27.1 (SS-0190.0)	The following commands shall be available in the online role (REX/SDP pop-up menu): a. Transition-to-Maintenance b. Swap (between selected and standby) c. Enable/disable auto reconfiguration d. Detailed subsystem status	X		4.4.1.15	4 5
0191.0	3.1.27.2 (SS-0191.0)	Each PSR channel shall monitor its equipment and report a summary status	X	X	4.4.1.15 4.4.2.2	4 5
0192.0	3.1.27.2 (SS-0192.1)	Channel summary status indications shall be provided to the site control and monitoring/RMS function in the local SCDIs/OMTs at least once per second and to the remote OMTs and NIMS on request	X	X	4.4.1.15 4.4.2.2	4 5
0193.0	3.1.27.2 (SS-0193.0)	More detailed status information shall be available when requested by the RMS function	X	X	4.4.1.15 4.4.2.2	4 5
0194.0	3.1.27.2 (SS-0194.1)	Detailed status information requested by the RMS function shall be displayed on both the local and remote OMTs and NIMS on request	X	X	4.4.1.15 4.4.2.2	4 5
0195.0	3.1.27.2 (SS-0195.0)	Fault monitoring shall be performed in all roles and modes of operation of the PSR with the exception of idle and fixed PRI modes in maintenance		X	4.4.2.2	4
0196.0	3.1.27.2 (SS-0196.0)	Faults shall only be reported after appropriate filtering has been applied to prevent the reporting of false or intermittent faults		X	4.4.2.2	4
0197.0	3.1.27.2 (SS-0197.0)	Results of fault detection/isolation testing shall be provided to the RMS for display on the local and remote OMTs and provided to the NIMS proxy agent	X	X	4.4.1.15 4.4.2.2	4 5
0198.0	3.1.27.2 (SS-0198.0)	Diagnostic results shall be made available and displayed so they can be understood without reference to other documentation	X	X	4.4.1.15 4.4.2.2 4.4.2.5	4 5 8
0199.0	3.1.27.3 (SS-0199.0)	Detection of marginal operation shall result in the generation of a warning message	X	X	4.4.1.15 4.4.2.2	4 5
0200.0	3.1.27.3 (SS-0200.0)	Functionality shall be provided to monitor the performance of critical radar parameters such as output power, stability, high beam, low beam, and weather MDS levels for both short and long pulse modes	X	X	4.4.1.15 4.4.2.2 4.4.2.4	4 5
0201.0	3.1.27.3 (SS-0201.1)	Smoothing and filtering of performance monitoring results shall be applied to prevent the generation of false alarms and reports	X	X	4.4.1.15 4.4.2.2	4 5
0202.0	3.1.27.3 (SS-0200.1)	Status of these critical radar parameters shall be provided to the maintenance operator along with local and remote OMT display of the following numeric values on a certification screen common to the PSR and MSSR: a. Transmitter short pulse and long pulse forward power b. Antenna reverse power c. Receiver target channel high beam short pulse and long pulse MDS d. Receiver weather channel short and long pulse MDS	X	X	4.4.1.15 4.4.2.2 4.4.2.4	4 5

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0202.1	3.1.27.3 (SS-0202.3)	Provision shall be made to measure, verify and calibrate internal measurements of transmitter forward power to ± 0.1 dB, reverse power to within ± 0.1 dB, and receiver sensitivity test signals to within ± 0.1 dB using calibrated internal test signals	X		4.4.1.15	4 5
0202.2	3.1.27.3 (SS-0202.2)	Provisions shall be made for gaining access to the internally generated receiver sensitivity test signals for the purpose of using these test signals with an externally calibrated step attenuator for measurement and verification of internal MDS measurements	X		4.4.1.15	4 5
0203.0	3.2 (SS-0203.0)	The MSSR shall be Mode S upgradeable, meeting the standards of ICAO Annex 10, Volume IV to amendment 71				
0204.0	3.2 (SS-0204.0)	A dual -redundant configuration shall be provided				
0205.0	3.2 (SS-0205.0)	The MSSR system shall comprise the following equipment: a. Two interrogators, each containing a transmitter, receivers and plot extraction, processing and formatting b. RF changeover unit c. Control and Monitoring System (CMS) d. Large Vertical Aperture (LVA) antenna				
0206.0	3.2 (SS-0206.0)	System control functions shall be included within the plot processor, providing for local and remote control and monitoring facilities	X	X	4.4.1.15 4.4.2.2	4 5
0207.0	3.2 (SS-0207.0)	A local CMS terminal (PC-based) shall be provided	X		4.4.1.15	4 5
0208.0	3.2 (SS-0208.0)	The local CMS terminal, when combined with the interface to the local RMS/OMT, shall provide control, monitoring and maintenance capabilities as required by the specification	X	X	4.4.1.15 4.4.2.2	4 5
0455.0	3.2.2 (SS-0455.0) 3.2.2.a (SRD)	The SSR shall comply with ATCRBS ground equipment requirements of FAA Order 1010.51A (for Modes 2, 3/A, and C) and ICAO Annex 10 and be fully compatible with the other ATCRBS elements described in these documents	X		4.4.1.13	6
0456.0	3.2.2 (SS-0456.0) 3.2.2.b (SRD)	The SSR shall achieve MSSR requirements for probability of detection, accuracy, and resolution for aircraft equipped with ATCRBS or Mode S transponders operating over the full range of acceptable limits specified in FAA Order 1010.51A	X		4.4.1.8 4.4.1.9 4.4.1.13	1 2 3
0457.0	3.2.2 (SS-0457.0) 3.2.2.c (SRD)	The SSR shall meet all requirements for a broad selection of PRFs to allow Government allocation of PRFs at all sites according to the requirements of FAA Order 6050.32 Paragraph 1302	X		4.4.1.13	6
0458.0	3.2.2 (SS-0458.0)	PRF selection shall be permitted in 1 Hz steps from 50 Hz to 450 Hz staggered by 0, 5%, or 10% enabling at least 15 independent fixed PRFs or equivalent staggered PRF sets	X		4.4.1.13	6

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0459.0	3.2.2 (SS-0459.0) 3.2.2.d (SRD)	The SSR shall be provided with a broad selection of PRF triggers from the ASR-11 system to allow Government allocation of PRFs at all sites according to the requirements of FAA Order 6050.32 Paragraph 1302	X		4.4.1.13	6
0460.1	3.2.2 (SS-0460.2)	The SSR shall provide up to 14 dB continuously variable adjustment of the MSSR transmitter power in each of the dual redundant interrogator cabinets by use of a variable attenuator integral to the transmitter interface module				
0461.0	3.2.2.1 (SS-0461.0)	MSSR requirements in paragraphs 3.2.2.3 to 3.2.2.11 and 3.4.2.4 (including subparagraphs) shall be met for PRFs as specified below: a. 200-250 Hz (60 nmi, 2 and 3 mode interlace) b. 200-250 Hz (120 nmi, 2 mode interlace) c. 259-375 Hz (120 nmi, 3 mode interlace)	X		4.4.1.13	1 2 3
0462.0	3.2.2.2 (SS-0462.0)	The MSSR shall provide an I^2SLS equivalent function by means of reflection processing over the complete 360° of coverage which suppresses the generation of false target reports due to main beam interrogations via permanent or temporary reflecting objects	X		4.4.1.10 4.4.1.13	1 2
0463.0	3.2.2.3 (SS-0463.0) 3.2.2.3 (SRD)	The MSSR shall process beacon targets, in the detection volume as defined below: a. Slant Range: 0.5 to 60 nmi b. Azimuth: 360° c. Altitude: 0 to 60,000 feet AGL as limited by the elevation coverage requirement d. Elevation: From 0.25° above local radar horizon as determined by earth curvature, atmospheric refraction and as further limited by terrain screening to 40° with respect to the horizontal plane at the radar antenna	X	X	4.4.1.8 4.4.1.9 4.4.1.13 4.4.2.1 4.4.2.4	1 5
0464.0	3.2.2.4 (SS-0464.0) 3.2.2.4 (SRD)	The MSSR P_d shall be 0.995 minimum for targets with a round reliability of 0.75 with three-fourths of the modes responding, in a steady state condition of 10,000 ATCRBS and 200 Mode S FRUIT per second, of which 30% are in the main beam	X	X	4.4.1.8 4.4.1.9 4.4.1.13 4.4.2.1	1 2
0465.0	3.2.2.5 (SS-0465.0) 3.2.2.5 (SRD)	The MSSR range error shall be ≤190 feet RMS with transponder error (includes bias) at any point in the detection volume	X	X	4.4.2.1 4.4.1.12 4.4.1.13	1 3
0466.0	3.2.2.6 (SS-0466.0) 3.2.2.6 (SRD)	With MSSR round reliability of 0.75, and all modes responding, the azimuth error shall be no greater than 0.08° RMS, including bias	X	X	4.4.2.1 4.4.1.12 4.4.1.13	1 3
0467.0	3.2.2.6.1 (SS-0467.0)	Difference channel input data shall be compared for each declared pulse which is ungarbled and the SDR determined for each pulse				
0468.0	3.2.2.6.1 (SS-0468.0)	The average of the available SDR values shall be used to determine the SDR of the reply				
0469.0	3.2.2.6.1 (SS-0469.0)	The reply SDR value shall be converted to an OBA by using a preset OBA look-up table				

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0470.0	3.2.2.6.1 (SS-0470.0)	The OBA table shall be specific to suit the installed antenna, with provision to modify it to suit particular site requirements				
0471.0	3.2.2.6.1 (SS-0471.0)	The OBA and boresight sign, associated with each reply, shall be combined with the instantaneous azimuth, to determine the monopulse azimuth for the reply				
0472.0	3.2.2.6.1 (SS-0472.0)	If no measured SDR value is obtainable for a reply then the uncorrected interrogation azimuth shall be used as the estimated azimuth				
0473.0	3.2.2.6.1 (SS-0473.0)	Replies with no measured SDR value which are assigned an estimated azimuth shall be flagged accordingly				
0474.0	3.2.2.6.1 (SS-0474.0)	Flagged azimuths shall ultimately be used in determining a target's azimuth only if no monopulse-derived azimuths are available across the whole beam dwell				
0475.0	3.2.2.6.2 (SS-0475.0)	Each successfully decoded reply shall be checked to determine whether it can be associated with an existing group of replies (from previous interrogations) or whether it should establish a new group				
0477.0	3.2.2.6.2 (SS-0477.0)	The reply shall be compared with existing groups on the basis of range, azimuth, and code content				
0478.0	3.2.2.6.2 (SS-0478.0)	The reply shall be accepted and combined with the group if it meets the following conditions: a. The range difference between the reply and the group is no greater than the range correlation parameter (typically 0.05 nmi) b. The difference between the azimuth estimates of the reply and the group (if both are available) is no greater than the azimuth correlation parameter (typically 0.7°) c. The high confidence code bits (for Modes 2, 3/A, B) of the reply agree with those of the group or, for Mode C, they differ by at most 1 bit d. The group has not already correlated with a reply from the current interrogation				
0479.0	3.2.2.6.2 (SS-0479.0)	If a successful correlation is achieved the group code shall be updated to include any new high confidence bits				
0480.0	3.2.2.6.2 (SS-0480.0)	If the reply association conditions are not met, then the reply shall be deemed to be the first reply of a new group				
0481.0	3.2.2.6.2 (SS-0481.0)	If a reply meets conditions a, b, and c, but not d, then the new group and the group with which the reply failed to correlate shall be code-swap candidates				
0482.0	3.2.2.6.2 (SS-0482.0)	The updated azimuth for the group shall be obtained by averaging the monopulse estimate of two valid replies close to, and approximately equally balanced about, boresight				

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0483.0	3.2.2.6.2 (SS-0483.0)	If no monopulse azimuths have been obtained the group azimuth shall be the mean of the first and last estimated azimuths				
0484.0	3.2.2.6.2 (SS-0484.0)	When the antenna boresight azimuth exceeds the azimuth of the last reply added to a group by a parametric value (typically 5°), the group shall be declared complete				
0485.0	3.2.2.6.2 (SS-0485.0)	Any group containing a single response shall be rejected, unless identified as a code-swap candidate				
0486.0	3.2.2.6.2 (SS-0486.0)	All unrejected groups shall be established as raw target reports and sent through to the track update process				
0487.0	3.2.2.7 (SS-0487.0) 3.2.2.7 (SRD)	At least 95% of the time, the MSSR shall resolve two detected, stationary and identical, non-interfering targets with the same center azimuth if they are separated in slant range by 0.05 to 0.5 nmi inclusive (assuming identical transponder delays) when both targets are within the coverage volume specified in paragraph 3.2.2.3	X		4.4.1.11 4.4.1.13	1 3
0489.0	3.2.2.7 (SS-0489.0) 3.2.2.7 (SRD)	The MSSR shall resolve the targets at least 99.9% of the time when they are separated by more than 0.5 nmi	X		4.4.1.11 4.4.1.13	3
0490.0	3.2.2.8 (SS-0490.1) 3.2.2.8 (SRD)	Assuming identical transponder delays, the MSSR shall resolve two detected identical targets that are within 0.05 nmi of each other in slant range and which are separated by 2.1° at least 95% of the time and resolve two targets that are within 0.05 nmi of each other in slant range and have at least one distinguishing characteristic (different mode 3/A code or a Mode C code representing an altitude separation of more than 500 ft.) and are separated by 1.5° at least 99% of the time			4.4.1.11 4.4.1.13	3
0491.0	3.2.2.9 (SS-0491.2)	The MSSR shall be capable of interlacing interrogation Modes 2, 3/A, and C in site-selectable mode patterns				
0492.0	3.2.2.10 (SS-0492.0)	The MSSR shall have the capacity of decoding up to four interleaved replies	X		4.4.1.13	1
0493.0	3.2.2.10 (SS-0493.0)	The digitized data received from the receiver shall be processed to detect and reconstruct individual pulses conforming to the detection requirements				
0502.0	3.2.2.11 (SS-0502.0) 3.2.2.11 (SRD)	MSSR codes shall be validated 95% of the time when four or more replies are received per mode	X		4.4.1.8 4.4.1.9 4.4.1.13	1 2
0503.0	3.2.2.11 (SS-0503.0) 3.2.2.11 (SRD)	MSSR code validations shall be correct at least 99% of the time in the presence of FRUIT as specified in paragraph 3.2.2.4	X		4.4.1.8 4.4.1.9 4.4.1.13	1 2
0505.0	3.2.2.11 (SS-0505.0) 3.2.2.11 (SRD)	The MSSR shall have validation of incorrect codes due to FRUIT or other causes less than 1% of the time	X		4.4.1.8 4.4.1.9 4.4.1.13	1 2

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
0506.0	3.2.2.11.1 (SS-0506.0)	In meeting the requirement to decode four interleaved replies simultaneously, two sets of four assemblers shall be provided; one set to process the Sum Video Amplitude (SVA) and another set to process the SDR				
0507.0	3.2.2.11.1 (SS-0507.0)	The assemblers shall be used to resolve ambiguities when associating individual pulses with a code train				
0508.0	3.2.2.11.1 (SS-0508.0)	Valid Mode C codes, according to ICAO Annex 10, shall be converted into flight level, even if SPI pulses are present				
0510.0	3.2.2.12 (SS-0510.2)	The MSSR shall be upgradeable to Mode S to provide for both surveillance and extended data link message (Level 4) capability as defined by 3.1.2 of ICAO Annex 10				
0511.0	3.2.2.13 (SS-0511.0)	The MSSR antenna shall have provisions to tilt the antenna ±5° referenced to the local horizon at 0° elevation angle		X	4.4.2.4	5
0512.0	3.2.2.13 (SS-0512.0)	Tilt provisions shall be independent of the primary radar antenna tilt				
0513.0	3.2.2.13 (SS-0513.0)	A means shall be included to measure the tilt, either with an integral mechanical tilt mechanism or through use of the external levels or electronic measuring devices				
0514.0	3.2.2.13.1 (SS-0514.0)	The LVA shall produce a ground roll off for the vertical path of at least 1.9 dB/degree at the -6 dB point to provide discrimination against multiple and reflected signals				
0515.25	3.2.2.13.2 (SS-0515.25)	Sum pattern beamwidth over elevation range of -2° to +40° shall be 2.4° ± 0.25° at –3 dB and 0° elevation and (3 dB beamwidth at 0° elevation)/[Cos (elevation angle)] + 15%, -10% at -2° to +40° elevation				
0515.02	3.2.2.13.2 (SS-0515.02)	Sum pattern sidelobes over elevation range of -2° to +40° shall be at least 26 dB below beam peak				
0515.03	3.2.2.13.2 (SS-0515.03)	Sum pattern peak gain over elevation range of -2° to +40° shall be at least 27 dB above isotropic				
0515.21	3.2.2.13.2 (SS-0515.21)	Sum pattern directional accuracy over elevation range of -1° to +40° over the range of 1030 ± 3.5 MHz and 1090 ± 5 MHz shall be within 0.2° between -1°and +10° elevation and within 0.3° between +10° and +40° elevation				
0515.05	3.2.2.13.2 (SS-0515.05)	Difference pattern sidelobe level at elevation of sum beam peak shall be at least 26 dB below sum beam peak				
0515.22	3.2.2.13.2 (SS-0515.22)	Coincidence of peak of sum beam and control notch of control beam shall be within 0.2° at 0° ± 0.2° elevation and otherwise within 0.3° between -2° to +40° elevation				
0515.07	3.2.2.13.2 (SS-0515.07)	Control pattern shall exceed the sum pattern by at least 6 dB, except within ± 4° of sum beam peak and where sum sidelobe level is ≤ -12 dBi				

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0515.23	3.2.2.13.2 (SS-0515.23)	Peak of sum/null of difference shall coincide to within 0.055° at 0 ± 0.2° elevation, otherwise to within 0.1° between -6° and +45° elevation				
0515.09	3.2.2.13.2 (SS-0515.09)	Difference pattern null depth shall be greater than 30 dB below peak of sum pattern				
0515.10	3.2.2.13.2 (SS-0515.10)	Equality of difference pattern peaks shall be within 0.3 dB				
0515.24	3.2.2.13.2 (SS-0515.24)	Intersection of sum/difference patterns shall be between 2.5 and 3.5 dB below peak of mainbeam and equal to within 0.3 dB				
0515.12	3.2.2.13.2 (SS-0515.12)	All relationships shall be maintained over the range -2° to +40°, except where otherwise stated				
0515.13	3.2.2.13.2 (SS-0515.13)	Sidelobes of the vertical pattern through the sum main beam peak shall be at least 18 dB below peak of mainbeam				
0515.14	3.2.2.13.2 (SS-0515.14)	Ground cutoff rate of the vertical pattern through the sum main beam peak shall be at least 1.9 dB/degree at –6 dB point				
0515.20	3.2.2.13.2 (SS-0515.20)	Minimum gain at 55° elevation for vertical pattern through the sum main beam peak shall be at least -4 dBi				
0515.16	3.2.2.13.2 (SS-0515.16)	Antenna pattern measurements shall be performed with the MRSM set to Mode B, maximum sensitivity				
0515.17	3.2.2.13.2 (SS-0515.17)	The plot extractor shall compare monopulse data from selected replies against a stored off-boresight azimuth lookup table for monopulse consistency measurements				
0515.81	3.2.2.13.2 (SS-0515.18)	Dimensions of the LVA shall be less that or equal to: a. Height: 2.06 m b. Width: 8.00 m c. Depth: 1.00 m				
0515.19	3.2.2.13.2 (SS-0515.19)	Mass of the LVA shall be less than or equal to 347 kg				
0209.0	3.2.3 (SS-0209.0)	The interrogator shall be all solid state				
0210.0	3.2.3 (SS-0210.0)	The interrogator shall be configured for dual-channel operation				
0211.0	3.2.3 (SS-0211.0)	Each interrogator shall be housed in a single cabinet and includes the transmitter, receiver, and MSSR processor				
0212.0	3.2.3.1 (SS-0212.0)	The interrogator shall generate the SSR interrogation pulses and transmit them into the sum and control ports of the monopulse LVA				
0213.0	3.2.3.1 (SS-0213.0)	The interrogator shall receive transponder responses via the sum, difference and control ports of the antenna, and detect, process and quantize the resulting video for further processing				
0214.0	3.2.3.1 (SS-0214.0)	The received MSSR video pulses shall be assembled into replies which are then decoded				
0215.0	3.2.3.1 (SS-0215.0)	Replies having similar characteristics from successive interrogations shall be correlated into groups				

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
0216.0	3.2.3.1 (SS-0216.0)	Reply groups shall be associated with existing tracks and target reports generated				
0217.0	3.2.3.1 (SS-0217.0)	Target reports identified as reflections shall be suppressed	X		4.4.1.10	2
0218.0	3.2.3.1 (SS-0218.0)	MSSR reports shall be associated with PSR reports				
0219.0	3.2.3.1 (SS-0219.0)	Combined reports generated by plot and track combination functions within the local site OMT shall be output for data remoting to the indicator and other sites				
0221.0	3.2.3.1 (SS-0221.0)	To reduce changeover time, track files shall be maintained in both interrogators by sending correlated reply groups received by the online interrogator to the standby interrogator				
0222.0	3.2.3.2 (SS-0222.0)	The transmitter shall generate all the RF interrogation signals for transmission on the sum and control patterns of the antenna via the RF changeover unit to the antenna				
0223.0	3.2.3.2 (SS-0223.0)	The transmitter shall be of fully solid-state design				
0224.0	3.2.3.2 (SS-0224.0)	The transmitter shall be capable of supplying three pulse SSR interrogation trains				
0226.0	3.2.3.2.2 (SS-0226.0)	There shall be two RF outputs, using the sum and control ports				
0227.0	3.2.3.2.2 (SS-0227.0)	All pulses except for sidelobe suppression pulses shall be output via the sum port				
0228.0	3.2.3.2.2 (SS-0228.0)	Sidelobe suppression pulses shall be output via the control port				
0229.0	3.2.3.2.2 (SS-0229.2)	The power output capability of the sum channel for Modes 2, 3/A, B, and C shall be not less than 30.5 dBW over the full operating temperature range				
0230.0	3.2.3.2.2 (SS-0230.1)	The output shall be not less than 31 dBW over equipment ambient temperatures between 15°C and 25°C				
0231.0	3.2.3.2.2 (SS-0231.0)	The control channel output power shall be within 0.5 dB of the sum channel				
0232.0	3.2.3.2.2 (SS-0232.0)	The power drop from the start of an interrogation to the end of the interrogation shall not exceed 1.0 dB for all interrogation types				
0233.0	3.2.3.2.2 (SS-0233.0)	The transmitter shall meet all RF performance requirements, with a maximum 0.5 dB reduction in transmitter power, while operating into a 1.5:1 load mismatch				
0234.0	3.2.3.2.2 (SS-0234.0)	The transmitter shall survive, without damage, operation into an infinite load mismatch at any phase angle				
0235.0	3.2.3.2.2 (SS-0235.0)	The isolation between the sum and control channels shall be not less than 35 dB				
0236.0	3.2.3.2.2 (SS-0236.0)	The transmitter in non Mode S systems shall be capable of operating at a constant duty cycle of 0.2%				
0237.0	3.2.3.2.2 (SS-0237.0)	Protection shall be provided against excessive duty cycle demands				

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0238.0	3.2.3.2.2 (SS-0238.0)	Transmitter overload conditions shall be reported in a status message		X	4.4.2.2	4
0239.0	3.2.3.2.3 (SS-0239.0)	The RF frequency of the outputs of the sum and control transmitter ports shall be within 1030 ±0.01 MHz				
0241.0	3.2.3.2.4 (SS-0241.0)	The transmitted frequency spectrum and out-of-band transmission levels shall be in accordance with ICAO Annex 10, Figure 3-2				
0242.0	3.2.3.2.4 (SS-0242.0)	The CW output power of spurious transmissions at 1030 ±0.2 MHz shall not exceed -76 dBW				
0243.0	3.2.3.2.4 (SS-0243.0)	Radiation, while transmitting, in radar frequency bands 1250 MHz - 1350 MHz and 2700 MHz - 3100 MHz shall not exceed -115 dB relative to peak power				
0244.0	3.2.3.2.4 (SS-0244.1)	Transmitter blanking in up to 8 predefined sectors, programmed via the CMS terminal shall be provided	X		4.4.1.15	4 5
0245.0	3.2.3.2.4 (SS-0245.0)	Transmitter blanking, the duration of which is determined by an external RS422 control input shall also be provided				
0246.0	3.2.3.2.4 (SS-0246.0)	In addition, it shall be possible to disable the transmitter output via a discrete line, for safety purposes		X	4.4.2.6	7
0247.0	3.2.3.2.4 (SS-0247.1)	When RF power is reduced to 1 dB below its preset level, a fault shall be reported by the BITE	X	X	4.4.1.15 4.4.2.2	4 5
0248.0	3.2.3.2.4 (SS-0248.0)	If the P1 and P3 RF pulsewidths deviate from the nominal width of 0.8 ±0.1 μs, a fault shall be reported by the BITE		X	4.4.2.2	4
0249.0	3.2.3.3 (SS-0249.0)	Three identical receiver channels shall be provided				
0250.0	3.2.3.3 (SS-0250.0)	One receiver channel shall handle signals from the sum port, one the difference port, and the third the control port				
0252.0	3.2.3.3 (SS-0252.0)	RF input signals shall be mixed with those of the local oscillator to produce IF signals				
0253.0	3.2.3.3 (SS-0253.0)	IF signals shall be amplified and filtered before logarithmic amplification and quantization				
0254.0	3.2.3.3 (SS-0254.0)	Each receiver shall provide, when measured at the receiver RF ports, the following: a. Mean of 3 dB Points: 1090 ±0.5 MHz b. Intermediate Frequency: 60 MHz (nominal) c. 3-dB Bandwidth: 1085.5 ±0.5 MHz to 1094.5 ±0.5 MHz (9MHz) d. 40-dB Bandwidth: >1078 to <1102 MHz (24 MHz) e. 60-dB Bandwidth: >1065 to <1115 MHz (50 MHz) f. Max Spurious and Image Response: -60 dB max over 225 to 1065 MHz and 1115 to 3500 MHz g. Tangential Sensitivity: -90 dBm h. A/D Dynamic Range: -16 to -96 dBm				

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0255.0	3.2.3.3 (SS-0255.0)	There shall be at least 60 dB isolation between the receiver channels to prevent cross-talk from corrupting accurate monopulse measurement				
0257.0	3.2.3.3 (SS-0257.0)	The sensitivity (gain and noise figure) of the receivers shall not be affected by variations in the transmitter output power				
0494.0	3.2.3.3 (SS-0494.0)	Linear and programmable STC thresholding on the Sum channel data shall be implemented to provide signal level detection thresholds for pulse declaration				
0495.0	3.2.3.3 (SS-0495.1)	For linear STC, the sensitivity shall be reduced immediately following an interrogation, selectable at a level from 0 to 64 dB below normal sensitivity, then progressively returned to full sensitivity at maximum range				
0496.0	3.2.3.3 (SS-0496.1)	The rate of return to full sensitivity shall be a site programmable parameter adjustable in up to 8 steps over the range (globally over azimuth				
0497.0	3.2.3.3 (SS-0497.1)	For programmable STC, the sensitivity shall be programmable for individual sector range cells with 64 equal sectors of 5.6° in azimuth and 1024 increments of 0.32 nmi in range				
	3.2.3.3 (SS-0497.2)	Each range increment for each sector shall be assigned a reciever sensitivity value in the range of –16 dBm to –96 dBm, to a precision of 0.3 dB				
0498.0	3.2.2.10 (SS-0498.0)	It shall be possible to switch off the linear or programmable STC at the SCDI				
0499.0	3.2.2.10 (SS-0499.0)	Short duration pulses shall be rejected when less than 187.5 ns in duration				
0501.0	3.2.2.10 (SS-0501.0)	Sum and control channel input data shall be compared to provide RSLS flags for all detected pulses where the control channel input exceeds the Sum channel input by a preset value programmable in the range ± 12 dB				
0258.0	3.2.3.3.1 (SS-0258.0)	Received video signals shall be available for monitoring purposes via the equipment cabinet				
0259.0	3.2.3.3.1 (SS-0259.0)	The output from logarithmic amplification shall be digitized, quantized to eight bits, at a clock rate of 16 MHz				
0260.0	3.2.3.3.1 (SS-0260.0)	The digital output shall be corrected for any errors in the logarithmic transfer characteristics, to an accuracy of ±1 dB, over the range of -26 dBm to -86 dBm and +1/-4 dB over the range of -16 dBm to -26 dBm				
0261.0	3.2.3.3.2 (SS-0261.0)	A boresight sign indication shall be derived by comparing the relative phase between the sum and difference channel IF signals				
0262.0	3.2.3.3.2 (SS-0262.0)	A positive sign shall be indicated for a reply originating to the right of antenna boresight where the difference channel is +90° with respect to the sum				

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0263.0	3.2.3.3.2 (SS-0263.0)	A negative sign shall be indicated for a reply originating to the left of antenna boresight where the difference channel is -90° with respect to the sum				
0264.0	3.2.3.3.2 (SS-0264.0)	A test signal shall be injected at the input of each receiver simultaneously				
0265.0	3.2.3.3.2 (SS-0265.0)	The test signal injected at the receiver inputs shall enable the gain to be measured and adjusted automatically				
0266.0	3.2.3.3.2 (SS-0266.0)	The test signal shall be injected at least once a second, outside the radar listening window				
0267.0	3.2.3.3.2 (SS-0268.2)	When the Sum/Difference Ratio (SDR) is less than 20 dB, the sum and difference amplitudes are greater than –83 dBm, and the phase difference is between 130° and 50°, the SDR shall be reported with the correct sign				
0269.0	3.2.3.3.2 (SS-0269.0)	Boresight sign determination shall operate with signals over at least 1090 ±4 MHz				
0270.0	3.2.3.3.2 (SS-0270.0)	In order to compensate for variation of phase shift with amplitude caused by the logarithmic amplifiers, the detected phase shall be corrected to minimize these errors				
0272.0	3.2.3.4 (SS-0272.0)	The embedded controller shall manage all of the control and monitoring functions for the MSSR, including monitoring and providing control data to the opposite channel				
0273.0	3.2.3.4 (SS-0273.0)	To permit uninterrupted operation in the event of a failure of part of the system, both channels shall normally operate online, each providing the same outputs				
0274.0	3.2.3.4 (SS-0274.0)	Data processing paths shall be duplicated across the channels to ensure that, in the event of an operational channel failure, the opposite channel output can be used with a loss of continuity of service not exceeding 4 seconds.	X		4.4.1.15	45
0275.0	3.2.3.4 (SS-0275.0)	The standby channel shall receive the raw target reports from the online channel				
0276.0	3.2.4 (SS-0276.0)	The RF changeover unit shall connect the sum, difference and control RF ports of the online interrogator to the antenna				
0277.0	3.2.4 (SS-0277.0)	The RF changeover unit shall connect the standby interrogator transmit ports to RF loads				
0278.0	3.2.4 (SS-0278.0)	The sum and difference receive channels, when routed to the antenna ports, shall be phased matched to permit relay replacement without affecting the system phase calibration				
0279.0	3.2.4 (SS-0279.0)	Tell-back signals shall be provided to each interrogator to indicate the destination of the interrogator output ports				
0280.0	3.2.4 (SS-0280.0)	The tell-back signals shall be mechanically linked to each coaxial relay				
0281.0	3.2.4 (SS-0281.0)	Control of the selected state shall be provided by the standby interrogator				

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
0282.0	3.2.4 (SS-0282.0)	The coaxial relays shall maintain their selected state in the absence of control signals or power supplies				
0283.0	3.2.5 (SS-0283.0)	The CMS within the MSSR shall provide within the embedded controller (EC) full control and monitoring capabilities which are self-contained within each channel	X		4.4.1.15	4 5
0284.0	3.2.5 (SS-0284.0)	Each channel's configuration control shall be governed by its own EC				
0285.0	3.2.5 (SS-0285.0)	Each channel's configuration control information shall be communicated between the two ECs				
0286.0	3.2.5 (SS-0286.0)	Users shall be provided with two modes of system availability: operational and maintenance. Normally, the overall system is in the operational mode. The operational channel connected to the transmitter is the online selected channel.	X	X	4.4.1.15 4.4.2.2	4 5
0287.0	3.2.5 (SS-0287.0)	After gaining permission from the single DASR/ASR 11 point of control, it shall be possible to reconfigure channels placing the online selected channel into standby and the standby channel into online selected	X	X	4.4.1.15 4.4.2.2	4 5
0288.0	3.2.5 (SS-0288.0)	After gaining permission from the single DASR/ASR 11 point of control, it shall be possible to place the hot standby channel into maintenance	X	X	4.4.1.15 4.4.2.2	4 5
0289.0	3.2.5 (SS-0289.0)	As part of the overall configuration control, any channel change required due to an equipment fault shall be determined and implemented by either EC		X	4.4.2.2	4
0290.1	3.2.5 (SS-0290.1)	In the event of a fault being detected in the on-line channel or the failure of the communications between ECs, the standby channel shall be capable of instigating channel switching, by means of the RF changeover unit		X	4.4.2.2	4
0291.0	3.2.5 (SS-0291.0)	Procedures shall be implemented to preclude repeated switchover due to communication failure between the ECs				
0291.5	3.2.5 (SS-0291.5)	Functionality shall be provided to monitor numerical values of the following certification parameters and to display them on a certification screen common to the MSSR and PSR and which is resident on local and remote OMTs: a. MSSR Sum and Control transmitter forward power (online and standby channels) b. MSSR Sum and Control reverse power (online and standby channels) c. MSSR Sum, Difference and Control channel sensitivities (83 dBm +/- 3 dB), i.e. minimum level detection amplitudes (standby channel only). It is assumed here that the channel changes are made periodically to measure the online channel. The last values for each receiver will be displayed for the online channel.	X	X	4.4.1.15 4.4.2.2	4 5
0291.6	3.2.5 (SS-0291.6)	Smoothing and filtering of results shall be applied to prevent the generation of false alarms or alerts	X	X	4.4.1.15 4.4.2.2	4 5

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
0291.7	3.2.5 (SS-0291.7)	Provision shall be made to measure and verify internal measurements of transmitter power, reverse power, and receiver sensitivity parameters using calibrated external test equipment and without loss of radar data to the ATC.	X	X	4.4.1.15 4.4.2.2	4 5
0291.8	3.2.5 (SS-0291.8)	Means shall be provided for a maintenance operator at the MSSR local CMS terminal to adjust/calibrate the internal MSSR certification parameter measurements that are displayed on the certification screen to within +/- 0.1 dB in power and to within +/- 1.0 dB in sensitivity on an interrogator by interrogator basis without interruption of data to the automation site.	X	X	4.4.1.15 4.4.2.2	4 5
0291.9	3.2.5 (SS-0291.9)	Dual directional couplers, 3 per interrogator shall be fitter between each interrogator and the changeover unit to service calibration of receiver sensitivity and Sum and Control channel forward and reverse powers without the need to disconnect and reconnect feeder cables from the transmitter interface. The specification of the couplers is: a. Frequency Range: 1010 to 1110 Mhz b. Insertion loss: 0.25 dB maximum c. VSWR: 1.25:1 maximum d. Couplin Factor: Forward and Reverse; 20 dB +/- 1 dB e. Directivity: Forward; Better than 20 dB and Reverse; Better than 30 dB				
0516.0	3.3 (SS-0516.0) 3.3 (SRD) 3.a.3.a (ORD)	The PSR shall detect, categorize, and report precipitation within the six reflectivity-intensity range levels (18 to 57 dBz) defined by the NWS		X	4.4.2.1	9
0517.0	3.3 (SS-0517.0)	The DASR/ASR 11 shall employ a beam filling algorithm				
0518.0	3.3.1 (SS-0518.0)	The PSR shall detect an 18 dBz beam filling weather echo in the clear out to 55 nmi.				
0519.0	3.3.2 (SS-0519.0)	In the absence of ground clutter, the maximum weather reporting error shall be 2.5 dB, including bias when operating in either linear or circular antenna polarization modes				
0520.2	3.3.3 (SS-0520.2) 3.3.3 (SRD) 3.a.3.e (ORD)	The DASR/ASR 11 shall complete collection and processing of all weather data within 6 scans or less, and input to the automation system (excluding paint of the weather map on the automation display) within 3 scans or less at completion of collection and processing. The 3 scans includes weather compaction and output by the local SCDI, transmission delay to the automation system, and in configurations including an SDT, processing of the weather map by the SDT processor, digital video conversion and buffering of the map to ready the map for analog paint on the automation display.	X		4.4.1.5	9
0521.0	3.3.4 (SS-0521.0) 3.3.4 (SS) 3.a.3.b (ORD)	The PSR shall report weather data for the complete volume with a data granularity of 0.5 nmi in range and 1.4°	X		4.4.1.5	9

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
0522.2	3.3.5 (SS-0522.2)	The PSR shall minimize biases for the weather reflectivity estimate that are input to the six-level thresholding process in accordance with Figure 3-8 for a weather signal to noise ratio of 10 dB. The figure presents the magnitude of maximum reflectivity estimate bias (dB) versus weather mean Doppler and weather-to-clutter power ratio. This requirement assumes a Gaussian-shaped power spectrum with spectrum width defined as the associated standard deviation.				
0523.0	3.3.5 (SS-0523.0)	Maximum allowed standard deviation of the estimate in the presence of ground clutter shall be 1 dB				
0524.0	3.3.6 (SS-0524.0)	The PSR weather processor shall eliminate all multitrip weather and multitrip terrain reports that overlay regions that are clear of clutter and within the instrumented range of the radar (60 nm) for all multitrip weather and/or terrain clutter extents	X		4.4.1.5	9
0524.1	3.3.6 (SS-0524.1)	The PSR weather processor shall eliminate all multitrip weather and multitrip terrain reports that overlay regions containing clutter within 60 nm for multitrip weather and/or terrain clutter beyond 60 nm, with combined range extents less than 7 nm	X		4.4.1.5	9
0525.0	3.3.7 (SS-0525.0)	The PSR shall censor aircraft returns, including multitrip echoes of less than 1/8 nmi in extent	X		4.4.1.5	9
0526.0	3.3.8 (SS-0526.0)	In the clear, the false weather report rate due to first time AP shall be less than 10% at all ranges where the AP system signal to noise exceeds 15 dB	X		4.4.1.5	9
0527.0	3.4.1 (SS-0527.0) 3.4.1 (SRD) 3.a.4.a (ORD)	The system shall provide target processing capacity as defined below: a. 700 real aircraft targets in any mix of PSR only, PSR/SSR merge, or SSR only targets, in the presence of an additional 300 false PSR reports and 100 false SSR reports, uniformly or non-uniformly distributed in azimuth for a 360° scan, and not be impacted by weather channel processing b. A peak of 250 targets uniformly distributed in a 90° sector c. A peak of 100 targets uniformly distributed across two contiguous 11.25° sectors d. A peak of 16 targets per a 1.3° wedge lasting for not more than two contiguous wedges	X		4.4.1.14	6

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0528.0	3.4.2.1 (SS-0528.0) 3.4.2.1 (SRD) 3.a.4.c (ORD) 3.a.4.d.2 (ORD)	Scan-to-scan correlation shall be used to reduce false alarms and assure a high confidence in reported aircraft targets with velocities of 25 to 700 knots and maneuvering up to 1g of centripetal or linear acceleration as follows: a. Report no more than 1 false scan-to-scan correlated search report per scan averaged over 15 minutes under normal clutter conditions. Normal clutter conditions include thermal noise, terrain, stationary discretes, sea and distributed rain. b. Report no more than 10 false scan-to-scan correlated search reports per scan averaged over 10 scans when the clutter environment exceeds normal conditions. Excessive clutter conditions include surface vehicles, anomalous propagation, angels, and cellular rain.	X		4.4.1.10	2
0529.0	3.4.2.1.1.1 (SS-0529.0)	The track processing function shall be capable of processing 700 tracks per scan within specified delay requirements				
0530.0	3.4.2.1.1.1 (SS-0530.0) 3.a.4.f (ORD)	When overload conditions prevail, priority shall be given to targets closest in range				
0531.0	3.4.2.1.1.1 (SS-0531.0) 3.a.4.f (ORD)	When overload conditions prevail, the targets farthest in range shall be dropped first				
0532.0	3.4.2.1.1.1 (SS-0532.0)	A warning indication that targets are being dropped shall be provided to the RMS	X	X	4.4.1.15 4.4.2.2	4 5
0533.0	3.4.2.1.1.1 (SS-0533.0)	When target reports are dropped under overload conditions a final report with a drop track indication shall be sent to the combiner				
0534.0	3.4.2.1.1.1 (SS-0534.0)	Test target reports and permanent echo/MTI reports shall not be dropped under overload conditions				
0535.0	3.4.2.1.1.1 (SS-0535.0)	An indication of the existence of an overload condition shall be provided in the PSR status report	X	X	4.4.1.15 4.4.2.2	4 5
0536.0	3.4.2.1.1.1 (SS-0536.0)	The track processor shall provide target tracks to the combiner/ formatter				
0537.0	3.4.2.1.1.1 (SS-0537.0)	The following information shall be included in the target track reports: a. Target position information in range and azimuth b. Smoothed speed and heading c. Indication of target quality d. Track file numbers				
0538.0	3.4.2.1.1.1.a (SS-0538.0)	For established tracks that associate with a target report, measured target positions shall be provided				
0539.0	3.4.2.1.1.1.a (SS-0539.0)	For coasted tracks, smoothed predicted target positions shall be provided				
0540.1	3.4.2.1.1.1.a (SS-0540.1)	For primitive reports, measured target positions shall be provided				
0541.0	3.4.2.1.1.1.b (SS-0541.0)	Smoothed speed and heading shall be provided for all established tracks				

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0542.0	3.4.2.1.1.2 (SS-0542.0)	The track processor shall use a scan-to-scan tracking algorithm for filtering target data to identify aircraft target reports while flagging or eliminating those which are not associated with moving aircraft targets				
0543.0	3.4.2.1.1.2 (SS-0543.0)	For maintenance purposes a count shall be kept of the number of target reports filtered out		X	4.4.2.2	5
0544.0	3.4.2.1.1.3 (SS-0544.0)	The track initiation algorithm shall generate and utilize speed and heading information as well as range and azimuth data to examine the validity of the initiated track before it is established by limiting the association volume for track initiation of the alpha, beta tracker				
0544.1	3.4.2.1.1.3 (SS-0544.1)	In order to be declared invalid the plot update shall be required to fall outside an association volume that is centered on the predicted position as determined from the reported position from the last two scans, and that has a radius equal to the correlation distance for which typical values are given below: Range (nmi) Correlation Distance 1 0.837 2 0.837 5 0.837 10 0.837 20 0.862 30 0.949 40 1.040 50 1.120 60 1.210 The track initiation window in time is a fixed parameter in the software build and is set to three scans for DASR/ASR 11				
0545.0	3.4.2.1.1.4 (SS-0545.0)	The track processor shall provide an indication of the last report of a track				
0546.0	3.4.2.1.1.4 (SS-0546.0)	The track drop indication shall be provided for the last coasted report, or under overload conditions for established target reports that are being dropped				
0547.0	3.4.2.1.1.4 (SS-0547.0)	Track file numbers from dropped tracks shall not be reused for a minimum of six scans				
0548.0	3.4.2.1.1.5 (SS-0548.0)	Elimination of target reports not associated with moving aircraft targets shall be achieved by the inclusion of a velocity editor	X		4.4.1.15	4 5
0549.0	3.4.2.1.1.5 (SS-0549.0)	The velocity shall be variable from site to site	X		4.4.1.15	4 5
0550.0	3.4.2.1.1.5 (SS-0550.0)	It shall be possible for the maintenance operator to enable/ disable the output of edited target reports in the radar data stream	X	X	4.4.1.15 4.4.2.2	4 5
0551.0	3.4.2.1.1.5 (SS-0551.0)	A tally of edited target reports shall be provided	X		4.4.1.15	4 5

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0552.0	3.4.2.1.1.6 (SS-0552.0)	The track processor shall provide provisions to output flagged targets which have not been associated with a track but which are considered true aircraft targets based on target characteristics				
0553.0	3.4.2.1.1.6 (SS-0553.0)	The track processor shall have provisions to output flagged primitive target reports in some range/azimuth defined area(s) around an airport				
0554.0	3.4.2.1.1.6 (SS-0554.0)	The area(s) shall be adjustable in increments of the radar resolution, and anywhere within the range of the radar				
0555.0	3.4.2.1.1.6 (SS-0555.0)	Flexibility shall exist so that up to 25 areas, each defined by four coordinates (start and stop range, start and stop azimuth) can be used				
0556.0	3.4.2.1.1.6 (SS-0556.0)	Definition or relocation of the area(s) shall be variable from site to site				
0557.0	3.4.2.1.1.6 (SS-0557.0)	It shall be possible for the maintenance operator to enable/ disable the output of these primitive reports	X	X	4.4.1.15 4.4.2.2	4 5
0558.0	3.4.2.1.1.6 (SS-0558.0)	A tally of discarded target reports shall be provided	X		4.4.1.15	4 5
0559.0	3.4.2.1.1.7 (SS-0559.0)	The track processor shall have provisions to ensure that targets in up to 25 specific areas are not used to initiate target reports	X		4.4.1.15	4 5
0560.0	3.4.2.1.1.7 (SS-0560.0)	These areas shall be defined by four coordinates each (start and stop range, start and stop azimuth)	X		4.4.1.15	4 5
0561.0	3.4.2.1.1.7 (SS-0561.0)	Definition of areas shall be variable from site to site	X		4.4.1.15	4 5
0562.0	3.4.2.1.1.7 (SS-0562.0)	It shall be possible for the maintenance operator to enable/ disable this GEO-map facility	X	X	4.4.1.15 4.4.2.2	4 5
0563.0	3.4.2.1.1.8 (SS-0563.0)	The following control commands shall be provided for the track processing capability in maintenance role only: start/stop track processing	X	X	4.4.1.15 4.4.2.2	4 5
0564.0	3.4.2.1.1.8 (SS-0564.0)	The following control commands shall be provided for the track processing capability in both online and maintenance roles: a. Slow target inhibit, enable/disable b. Primitive target inhibit, enable/disable c. Track initiate inhibit, enable/disable	X	X	4.4.1.15 4.4.2.2	4 5
0565.1	3.4.2.1.1.8 (SS-0565.1)	The track processing capability shall provide the following status indications to the PSR control and monitoring capability: a. Slow target inhibit, enable/disable b. Primitive target inhibit, enable/disable c. Track initiate inhibit, enable/disable	X	X	4.4.1.15 4.4.2.2	4 5
0566.0	3.4.2.2 (SS-0566.0)	Scan-to-scan correlation requirements which relate to ensuring high confidence in reported aircraft targets with velocities of 25 to 700 knots shall be met with maneuvers of up to 3 g				
0567.0	3.4.2.3 (SS-0567.0)	The PSR shall report targets prior to scan-to-scan correlation with a maximum of 100 false search reports per scan in three consecutive scans in normal and excessive clutter conditions	X		4.4.1.10	2

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0568.0	3.4.2.3.2 (SS-0568.0)	The plot processing function shall receive target detections from the DSP processor and develop a single target report for each separable cluster of target detections				
0569.0	3.4.2.3.2 (SS-0569.0)	The target report (plot) shall include an estimate of range precise to the nearest 1/64 nmi, and of azimuth precise to the nearest 0.022°. The target plot will also include a target strength indication.				
0571.0	3.4.2.3.2 (SS-0571.0)	The plot processing function shall be capable of processing 700 real aircraft plots in the presence of 300 false PSR reports per scan within the delay requirements specified				
0572.0	3.4.2.3.2 (SS-0572.0)	Under conditions of angel activity the plot processing function shall modify its performance (in the vicinity of the area affected) in steps as the angel activity increases to avoid system overload				
0573.0	3.4.2.3.2 (SS-0573.0)	The plot processing function shall include adaptive functions to prevent overload of the plot processing function and track processing function				
0574.0	3.4.2.3.2 (SS-0574.0)	The plot processor shall provide radar target reports (plots) to the track processing function				
0575.1	3.4.2.3.2 (SS-0575.1)	The capability to also provide radar target reports (plots) to the radar surveillance display and to the plot combiner shall be provided.				
0576.0	3.4.2.3.3 (SS-0576.0)	The capability of resolving two targets from clusters of detections overlapping in range or in azimuth (complex clusters) shall be provided				
0577.0	3.4.2.3.3 (SS-0577.0)	As a minimum this validity check shall examine the range extent and the azimuth extent of the developed cluster				
0578.0	3.4.2.3.3 (SS-0578.0)	A tally of generated plots and a tally of suppressed plots shall be maintained and provided to the maintenance operator upon request	X		4.4.1.15	4 5
0579.0	3.4.2.3.4 (SS-0579.0)	Under overload conditions plots shall automatically be deleted on a range priority basis with plots furthest in range being deleted first				
0580.0	3.4.2.3.4 (SS-0580.0)	A status message shall be provided in the PSR status report indicating the presence of an overload condition	X	X	4.4.1.15 4.4.2.2	4 5
0581.0	3.4.2.3.4 (SS-0581.0)	A tally of deleted plots shall be provided				
0582.0	3.4.2.3.4 (SS-0582.0)	Test target reports and permanent echo plots shall not be deleted under overload conditions				
0583.0	3.4.2.3.5 (SS-0583.0)	The plot processing function shall have a range azimuth gated (RAG) capability of masking out ground traffic at some locations within the radar coverage area	X		4.4.1.15	4 5
0584.0	3.4.2.3.5 (SS-0584.0)	The enable/disable of this capability shall be an operator control	X	X	4.4.1.15 4.4.2.2	4 5
0585.0	3.4.2.3.5 (SS-0585.0)	A tally of plots edited out by this capability shall be provided	X		4.4.1.15	4 5

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0586.0	3.4.2.3.6 (SS-0586.0)	The plot processing capability shall apply adaptive range thresholding to its input data to prevent its input buffers from overflowing when excessive detections prevail				
0587.0	3.4.2.3.6 (SS-0587.0)	The plot processing capability shall apply adaptive range thresholding to its output data to prevent its output buffers from overflowing when excessive plots have been generated				
0588.0	3.4.2.3.6 (SS-0588.0)	An adaptive amplitude thresholding capability shall be provided to control angel activity	X		4.4.1.8 4.4.1.9 4.4.1.10	1 2
0589.0	3.4.2.3.6 (SS-0589.0)	The adaptive amplitude thresholding shall be arranged as range azimuth sectors. The radar coverage area is divided into four azimuth quadrants and six equal range bands where each cell has its own amplitude threshold.				
0590.0	3.4.2.3.6 (SS-0590.0)	It shall be possible to independently vary the plot count thresholding parameters for each range band.	X		4.4.1.15	4 5
0591.0	3.4.2.3.6 (SS-0591.0)	The enable/disable of this capability shall be an operator control	X	X	4.4.1.15 4.4.2.2	4 5
0592.0	3.4.2.3.6 (SS-0592.0)	A tally of plots suppressed by this capability shall be provided	X		4.4.1.15	4 5
0593.0	3.4.2.3.7 (SS-0593.0)	It shall be possible to inhibit plot processing when in the maintenance role (channel idle command).	X		4.4.1.15	4 5
0594.0	3.4.2.3.7 (SS-0594.0)	The following control commands shall be provided for the plot processing capability in both online and maintenance roles: a. Target RAG map blanking enable/disable b. Complex cluster(processing) enable/disable c. Valid cluster (processing) enable/disable d. Input thresholding enable/disable e. Output thresholding enable/disable f. Amplitude thresholding enable/disable g. Weather RAG map blanking enable/disable	X	X	4.4.1.15 4.4.2.2	4 5
0595.0	3.4.2.3.7 (SS-0595.0)	The plot processing capability shall provide the following status indications: a. Target RAG map blanking enabled/disabled b. Complex cluster processing enabled/disabled c. Valid cluster checking enabled/disabled d. Input thresholding enabled/disabled e. Output thresholding enabled/disabled f. Amplitude thresholding enabled/disabled g. Input thresholding occurring (satus message) h. Output thresholding occurring (status message) i. Weather RAG map blanking enabled/disabled	X	X	4.4.1.15 4.4.2.2	4 5
0596.0	3.4.2.4 (SS-0596.0) 3.4.2.4 (SRD)	The MSSR shall report no more than one false target report per scan when averaged over 15 minutes in the steady-state FRUIT condition of 10,000 ATCRBS and 200 Mode S FRUIT per second of which 30% are in the main beam	X		4.4.1.10 4.4.1.13	2

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
0597.0	3.4.2.4 (SS-0597.0) 3.4.2.4 (SRD)	The MSSR shall generate no more than one split target per scan when averaged over 15 minutes. This includes single aircraft beacon's discrete Mode 2 and Mode 3 replies and non-discrete replies	X		4.4.1.10 4.4.1.13	2
0598.0	3.4.2.4 (SS-0598.0)	The MSSR shall report no more than one false target report per scan averaged over 15 minutes due to reflections of the main beam caused by permanent or temporary reflecting objects	X		4.4.1.10 4.4.1.13	2
0599.0	3.4.2.4.1 (SS-0599.0)	Target reports that have not been associated with existing tracks shall be suppressed. They will be retained until the next antenna scan for potential use in track initiation				
0600.0	3.4.2.4.1 (SS-0600.0)	In the event of a target being split into two reports, due to intermode transponder delays or FRUIT, the reports shall be combined.	X		4.4.1.10 4.4.1.13	2
0601.0	3.4.2.4.1 (SS-0601.0)	High altitude, short range reports not associating with a track shall be compared with existing tracks and deleted if the range and codes are found to match	X		4.4.1.10 4.4.1.13	2
0602.0	3.4.2.4.2 (SS-0602.0)	Fixed reflector files shall be generated during the MSSR site set-up and updated as part of the maintenance of performance, where, for example, buildings are erected near the radar				
0603.0	3.4.2.4.2 (SS-0603.0)	The fixed reflector files shall be stored in and maintained by each interrogator				
0604.0	3.4.2.4.2 (SS-0604.0)	Target reports shall be checked for false or real by comparing targets and tracks with the same Mode A code				
0605.0	3.4.2.4.2 (SS-0605.0)	Where non-discrete Mode-A codes, or incomplete Mode 3/A codes (i.e. some low confidence pulses), or missing Mode A codes (the aircraft does not respond to Mode 3/A), exist, then, if the report lies in the direction of a reflector, the geometry of this reflector shall be used to attempt to find the location of a possibly real target.				
0606.0	3.4.2.4.2 (SS-0606.0)	Detected reflections shall be deleted from the target report lists				
0607.0	3.4.2.4.2 (SS-0607.0)	The presence of temporary reflectors shall be determined by the detection of multiple detected targets having the same unique Mode-A codes				
0608.0	3.4.2.4.2 (SS-0608.0)	Temporary reflectors shall be computed, recorded and treated like fixed reflectors until reflections have ceased for a preset period				
0609.0	3.4.2.4.2 (SS-0609.0)	The permanent reflector file and the temporary reflector file shall each have the capacity for at least 50 reflectors				
0610.0	3.4.3 (SS-0610.0) 3.4.3 (SRD)	The ASR-11 shall merge SSR and PSR target reports when the same aircraft target is detected by both radars	X		4.4.1.13	2
0611.0	3.4.3 (SS-0611.0)	These PSR and SSR targets shall be successfully merged 98% of the time.	X		4.4.1.8 4.4.1.9	1

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0612.3	3.4.3 (SS-0612.3)	The ASR-11 shall have the capability to inhibit merge of SSR and PSR reports through the use of variable site parameters (VSP's) on the OMT/SCDIs and offset the SSR reports in range through use of VSPs on the MSSR CMS terminal.	X		4.4.1.15	4 5
0613.0	3.4.3 (SS-0613.0)	The ASR-11 shall provide the following site-selectable sources for range and azimuth position data for merged target reports: 1. Range and azimuth of the SSR target 2. Range and azimuth of the PSR target	X		4.4.1.15	4 5
0614.1	3.4.3.1 (SS-0614.1)	The basic selection of PSR or SSR position data to be incorporated in a combined output report shall be made by VSP. An algorithm based on the present coast status of each return is permitted to over-ride this selection. (e.g. If the SSR is the VSP selected source and a combined output is made up of a coasted SSR report and a true PSR report, then the PSR position data will be used).	X		4.4.1.15	4 5
0615.0	3.4.3.1 (SS-0615.0)	The combining of PSR and SSR data shall be based on, as a minimum, the range and azimuth of the target's reports				
0616.0	3.4.3.1 (SS-0616.0)	Where speed and heading information and history are available from the radars these criteria shall also be used to reduce the likelihood of false combinations				
0617.0	3.4.3.1 (SS-0617.0)	A single track and/or plot report on a target shall be transmitted from the local SCDI only once per radar scan, per data stream, for each combined or uncombined target within the radar coverage.				
0618.0	3.4.3.1 (SS-0618.0)	Measured target position data from the current scan shall normally be reported				
0619.0	3.4.3.1 (SS-0619.0)	Predicted PSR values, if available from the radar, shall be used for up to six consecutive antenna scans if no replies from that target are received				
0620.0	3.4.3.1 (SS-0620.0)	A VSP number of scans can be used by the MSSR. No PSR or SSR target track or plot report shall be used as the basis for more than one track or plot output report, respectively, from the SCDI.				
0621.0	3.4.3.1 (SS-0621.0)	All target reports received by the combiner/formatter shall form output reports except under sector blanking or overload conditions				
0622.0	3.4.3.1 (SS-0622.0)	The position report shall be accompanied by a target file number unique to each target				
0623.0	3.4.3.2 (SS-0623.0)	It shall be possible to inhibit the reporting of targets found in up to 10 independent sectors	X		4.4.1.15	4 5
0624.0	3.4.3.2 (SS-0624.0)	The size of these sectors shall be selectable by defining the start and stop azimuth and start and stop range extent bounding the area	X		4.4.1.15	4 5
0625.0	3.4.3.2 (SS-0625.0)	The sector bounds shall be selectable in 1° increments in azimuth and 1/64 nmi in range				
0626.0	3.4.3.2 (SS-0626.0)	An additional parameter for each sector shall permit the inhibition to be overridden for reports with SSR emergency codes.	X		4.4.1.15	4 5

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0627.0	3.4.3.2 (SS-0627.0)	When an established track enters a blanked sector the combiner/formatter shall generate a drop track message for that track				
0628.0	3.4.3.2 (SS-0628.0)	The drop track message shall indicate the current position of the track				
0629.0	3.4.3.3 (SS-0629.0)	The status message shall be sent to the RMS at periodic intervals of once a scan and within a second in the event that the status changes	X	X	4.4.1.15 4.4.2.2	4 5
0631.0	3.4.3.4 (SS-0631.0)	Time reports shall be included in the radar data streams for each 1/32 of an antenna rotation (11.25°)				
0633.0	3.4.3.5 (SS-0633.0)	A tally shall be kept of the numbers and types of messages processed in the last scan, last minute and last hour and reported to the operator on request	X		4.4.1.15	4 5
0634.0	3.4.3.5 (SS-0634.0)	The detection of PSR permanent echo reports and SSR PARROT reports shall be used to generate a statistical determination of the probability of detection performance of the radars	X		4.4.1.8 4.4.1.9 4.4.1.15	1 4 5
0635.1	3.4.3.5 (SS-0635.1)	A warning message shall be provided to the RMS if either the PSR or SSR target reports fall below a VSP probability of detection threshold.	X	X	4.4.1.15 4.4.2.2	4 5
0636.0	3.4.3.5 (SS-0636.0)	A statistical check of PSR and SSR collimation shall be made by summing and averaging for each scan the range and azimuth differences between PSR and SSR target positions that result in a combined report	X		4.4.1.15	4 5
0637.0	3.4.3.5 (SS-0637.0)	These performance measures shall be made available to the RMS upon request	X	X	4.4.1.15 4.4.2.2	4 5
0638.0	3.4.3.6 (SS-0638.0)	The following control commands shall be provided when the SCDI/OMT is in the maintenance role only: a. Combination Processing enable/disable b. Select PSR data stream channel A/B c. Select SSR data stream channel A/B d. Weather Processing enable/disable e. Enable/disable PSR data stream f. Enable/disable SSR data stream g. Restart (operational program off/on)	X	X	4.4.1.15 4.4.2.2	4 5
0639.0	3.4.3.6 (SS-0639.0)	The following control commands shall be provided when the SCDI/OMT is in online or maintenance roles: a. Sector blanking enable/disable b. Display tallies (menu item)	X	X	4.4.1.15 4.4.2.2	4 5

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0640.0	3.4.4 (SS-0640.0) 3.4.4 (SRD)	Under peak capacity conditions, the DASR/ASR-11delay shall be no greater than: a. 1.3 seconds for correlated digital PS reports, exclusive of communication equipment delay b. 0.8 seconds for uncorrelated digital PSR only reports, exclusive of communication equipment delay c. 0.8 seconds for SSR only reports and SSR/PSR merged reports out of the uncorrelated data stream, exclusive of communication equipment delay d. 1.3 seconds for correlated digital PSR/SSR merged reports, exclusive of communication equipment delay e. 1.7 seconds for reconstituted video, exclusive of communication equipment delay f. No greater than 0.3 seconds for the communications equipment	X		4.4.1.14 4.4.1.1 4.4.1.2 4.4.1.3	6
0641.0	3.4.5 (SS-0641.0) 3.4.5 (SRD)	When the target load exceeds the capacity defined in 3.4.1, the ASR-11 shall have internal processing capable of automatically decreasing the number of reports	X		4.4.1.14	6
0642.0	3.4.5 (SS-0642.0)	In severe overload cases, the ASR-11 shall incrementally reduce processor maximum range on primary targets in order to ensure maintaining the performance requirements on beacon targets	X		4.4.1.14	6
0643.0	3.4.5 (SS-0643.0)	When the overload condition clears, full reporting of all targets out to maximum slant range shall be restored	X		4.4.1.14	6
0644.0	3.5 (SS-0644.0) 3.5 (SRD)	The ASR-11 shall be capable of: a. Local and remote monitoring PSR and SSR parameters required for certification, including receiver sensitivity, transmitted power, and reflected power b. Local and remote control, monitoring, and troubleshooting from Operator Maintenance Terminals (OMT); the requirements for remote control, monitoring, and troubleshooting are contained in the maintenance interface requirements document (IRD) "A" for the RMS.	X		4.4.1.15	4 5
0645.0	3.5.1 (SS-0645.0) 3.5.1 (SRD)	The ASR-11 shall provide identical control panels and associated software at all ATC sites (radar site, TRACON and ATC towers)	X	X	4.4.1.15 4.4.2.5	4 5 8
0646.0	3.5.1 (SS-0646.0)	These panels shall include all controls switches and indicators required for control and status functions as defined in paragraph 3.5.2	X	X	4.4.1.15 4.4.2.1 4.4.2.2 4.4.2.5	4 5 8
0647.0	3.5.1 (SS-0647.0)	The panels shall be designed for flush mounting				
0649.0	3.5.1 (SS-0649.0)	All external connections to the panels shall be by means of quick-disconnect jacks and plugs				
0650.0	3.5.1 (SS-0650.0)	Controls and indicators shall be clearly visible in the tower cab and TRACON lighting environments		X	4.4.2.1 4.4.2.2 4.4.2.5	8

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0651.1	3.5.1 (SS-0651.1)	Each panel shall have an aural alarm and comply with the best commercial practice human interface requirements		X	4.4.2.1 4.4.2.2 4.4.2.5	8
0652.0	3.5.1 (SS-0652.0)	The antenna rotation control switch shall be protected against accidental activation		X	4.4.2.6	7
0653.1	3.5.2 (SS-0653.1)	System controls shall be provided on the panels for the following functions: a. System Alarm — Control: No — Status: Yes b. System On-line — Control: No — Status: Yes c. PSR A (On-line) — Control: Yes — Status: Yes d. PSR B (On-line) — Control: Yes — Status: Yes e. (PSR) Selected A/B — Control: Yes — Status: Yes f. SSR A (On-line) — Control: Yes — Status: Yes g. SSR B (On-line) — Control: Yes — Status: Yes h. (SSR) Selected A/B — Control: Yes — Status: Yes i. SCDI A (On-line) — Control: Yes — Status: Yes j. SCDI B (On-line) — Control: Yes — Status: Yes k. (SCDI) Selected A/B — Control: Yes — Status: Yes l. UPS Status — Control: No — Status: Yes m. EGEN — Control: Yes — Status: Yes n. (Site) Power Status — Control: No — Status: Yes o. Antenna — Control: Yes — Status: Yes p. Polarizer Lin/Circ — Control: Yes — Status: Yes q. Transmitter Status — Control: No — Status: Yes r. Take Control/Release Contro — Control: Yes — Status: Yes	X	X	4.4.1.6 4.4.1.15 4.4.2.2	4 5
0654.1	3.5.2 (SS-0654.1)	If redundant elements are used, then control and status readback functions for both elements shall be displayed				
0655.0	3.5.2.1 (SS-0655.0)	The ASR-11 shall have dual redundant OMTs/SCDIs and associated interfaces to the PSR and MSSR	X		4.4.1.15	4 5
0656.0	3.5.2.1 (SS-0656.0)	In the event of detection of failure of one of the communication interfaces, the OMT/SCDI shall reconfigure to use the other	X	X	4.4.1.15 4.4.2.2	4 5
0657.0	3.5.2.1 (SS-0657.0)	The redundancy shall ensure that a single failure of an OMT/SCDI does not result in the loss (as quantified in 3.7.3 with respect to automatic reconfiguration within 4 sec.) of radar data or control and status data to the user		X	4.4.2.2	4
0658.0	3.5.2.1 (SS-0658.0)	It shall be possible to perform maintenance on an OMT/SCDI or its interfaces without degradation of normal operation of the ASR-11 system	X	X	4.4.1.15 4.4.2.2	4 5
0659.1	3.5.2.1 (SS-0659.1)	It shall be possible to turn off and then disconnect the OMT/SCDI in a maintenance role without disrupting the operation of the online OMT/SCDI	X	X	4.4.1.15 4.4.2.2	4 5
0660.0	3.5.2.1 (SS-0660.0)	Each OMT/SCDI shall be provided with a means of identification as either Channel A or as Channel B to allow for role determination, reconfiguration, etc.	X	X	4.4.1.15 4.4.2.2	4 5
0661.0	3.5.2.1 (SS-0661.0)	Each SCDI shall interface with a single Facilities Monitoring And Control (FMAC) unit	X	X	4.4.1.6 4.4.1.15	4 5

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0662.0	3.5.2.2 (SS-0662.0)	The online-selected OMT/SCDI shall accept radar data streams from online channels of the PSR and MSSR, combine them and output the resultant combined data stream to the radar data remoting subsystem				
0663.0	3.5.2.2 (SS-0663.0)	The selected OMT/SCDI shall provide the maintenance operator with the capability to monitor and control all the radar site equipment	X	X	4.4.1.6 4.4.1.15 4.4.2.2	4 5
0664.0	3.5.2.2 (SS-0664.0)	The selected OMT/SCDI shall serve as the online-selected RMS	X	X	4.4.1.15 4.4.2.2	4 5
0665.0	3.5.2.2 (SS-0665.0)	The online-selected OMT/SCDI shall provide a radar surveillance display	X		4.4.1.15	4 5
0666.0	3.5.2.2 (SS-0666.0)	The online-standby OMT/SCDI shall accept radar data streams from online channels of the PSR and SSR				
0667.0	3.5.2.2 (SS-0667.0)	The online-standby OMT/SCDI shall maintain the same configuration as the online-selected OMT/SCDI in order to provide the maximum transparency to the user in the event of a reconfiguration	X	X	4.4.1.15 4.4.2.2	4 5
0668.0	3.5.2.2 (SS-0668.0)	An online-standby OMT/SCDI shall provide the maintenance operator with the capability to monitor but not control any radar site equipment	X	X	4.4.1.6 4.4.1.15 4.4.2.2	4 5
0669.0	3.5.2.2 (SS-0669.0)	The online-standby OMT/SCDI shall provide a surveillance radar display	X		4.4.1.15	4 5
0670.0	3.5.2.2 (SS-0670.0)	Only one OMT/SCDI shall be in the selected mode at a given time	X	X	4.4.1.15 4.4.2.2	4 5
0671.0	3.5.2.2 (SS-0671.0)	It shall be an invalid state for two online OMTs/SCDIs to be in the standby mode at the same time	X	X	4.4.1.15 4.4.2.2	4 5
0672.0	3.5.2.2 (SS-0672.0)	Only operational commands shall be actioned by OMTs/SCDIs in the online role	X	X	4.4.1.15 4.4.2.2	4 5
0673.0	3.5.2.2 (SS)-0673.0	The standby OMT/SCDI shall not control any online radar site equipments	X	X	4.4.1.15 4.4.2.2	4 5
0674.0	3.5.2.2 (SS-0674.0)	The maintenance role combiner/ formatter function shall be under the maintenance operator's control	X	X	4.4.1.15 4.4.2.2	4 5
0675.0	3.5.2.2 (SS-0675.0)	Operational and maintenance OMT/ SCDI commands shall be actioned by OMTs/SCDIs functioning in the maintenance role	X	X	4.4.1.15 4.4.2.2	4 5
0676.0	3.5.2.3 (SS-0676.0)	The following commands shall be available in the maintenance role: a. Transition-to-online b. Enable/disable surveillance radar display	X	X	4.4.1.15 4.4.2.2	4 5
0677.0	3.5.2.3 (SS-0677.0)	The following commands shall be available in the online role: a. Transition-to-maintenance b. Swap (between selected and standby) c. Enable/disable auto reconfiguration d. Enable/disable surveillance radar display	X	X	4.4.1.15 4.4.2.2	4 5
0678.0	3.5.2.4 (SS-0678.0)	The status of the OMT/SCDI shall be monitored in maintenance and online roles	X	X	4.4.1.15 4.4.2.2	4 5
0679.0	3.5.2.4 (SS-0679.0)	A serviceable/failed indication shall be provided to the site control and monitoring function (RMS) at least once per second	X	X	4.4.1.15 4.4.2.2	4 5

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
0680.0	3.5.2.4 (SS-0680.0)	Results of fault detection/fault isolation testing shall be forwarded to the RMS function	X	X	4.4.1.15 4.4.2.2	4 5
0681.0	3.5.2.4 (SS-0681.0)	The diagnostic results shall be displayed so they can be understood without reference to other documentation	X	X	4.4.1.15 4.4.2.2	4 5
0682.0	3.5.2.5 (SS-0682.0)	On detection of a failure condition a OMT/SCDI shall be declared failed by either itself or the other OMT/SCDI	X	X	4.4.1.15 4.4.2.2	4 5
0683.0	3.5.2.5 (SS-0683.0)	If the OMT/SCDI is in an online role with the alternate channel in an online role and if automatic reconfiguration is enabled, the failed channel shall assume the maintenance role	X	X	4.4.1.15 4.4.2.2	4 5
0684.0	3.5.2.5 (SS-0684.0)	If the OMT/SCDI is in an online role with the alternate channel in an online role and if automatic reconfiguration is enabled, the alternate channel shall assume, or remain in, the online-selected role	X	X	4.4.1.15 4.4.2.2	4 5
0685.0	3.5.2.5 (SS-0685.0)	If automatic reconfiguration is disabled then a failed OMT/SCDI shall not reconfigure automatically	X	X	4.4.1.15 4.4.2.2	4 5
0686.0	3.5.2.5 (SS-0686.0)	If there is no online-standby OMT/SCDI available then an online-selected SCDI shall not reconfigure to maintenance in the event of detection of a failure	X	X	4.4.1.15 4.4.2.2	4 5
0687.0	3.5.2.5 (SS-0687.0)	Combiner-generated correlated/track file numbers (TFNs) identifying targets shall be maintained such that there is no change in TFNs to the end user at the Automation system in the event of a reconfiguration		X	4.4.2.1	6
0688.0	3.5.2.5 (SS-0688.0)	Equipment control selections issued to the online-selected OMT/SCDI shall be duplicated in the online- standby SCDI such that the equipment configuration is maintained in the event of a reconfiguration	X	X	4.4.1.15 4.4.2.2	4 5
0689.0	3.5.2.6 (SS-0689.0)	The remote OMTs/SCDIs shall contain the same maintenance screens and site control functions as the local OMTs/SCDIs	X	X	4.4.1.15 4.4.2.2	4 5
0690.1	3.5.3 (SS-0690.1)	The control panels, operator maintenance terminal (OMT), and future NIMS proxy agent shall be shall be ASR-11 points of control	X	X	4.4.1.15 4.4.2.2	4 5 6
0691.0	3.5.3 (SS-0691.0)	Only one control point shall be designated as the primary point of control (locking out all others) for the radar site equipment	X	X	4.4.1.15 4.4.2.2	4 5
0692.0	3.5.3 (SS-0692.0)	The capability shall be provided for transfer of control between designated control points	X	X	4.4.1.15 4.4.2.2	4 5
0693.0	3.5.3 (SS-0693.0)	The transfer of control between two control points shall require deliberate and coordinated action at each of those control points	X	X	4.4.1.15 4.4.2.2	4 5
0694.1	3.5.3 (SS-0694.1)	Visual signals shall be provided at both control points during control transfers (except for the future NIMS proxy agent)	X	X	4.4.1.15 4.4.2.2	4 5
0695.0	3.5.3 (SS-0695.0)	The system status shall not change due to a control point transfer	X	X	4.4.1.15 4.4.2.2	4 5
0696.0	3.5.3 (SS-0696.0)	Each control point shall provide a visual indication of its status	X	X	4.4.1.15 4.4.2.2	4 5

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0696.1	3.5.3 (SS-0696.1) 3.5.3 (SRD)	If a ASR-11 control panel is in control, system status shall be provided to the OMTs and future NIMS proxy agent.	X	X	4.4.1.15 4.4.2.2	4 5 6
0697.0	3.5.4 (SS-0697.0) 3.5.4 (SRD)	A surveillance display shall be provided at the radar site to display selected PSR and SSR target reports and weather	X	X	4.4.1.15 4.4.2.2	4 5 9
0698.0	3.5.4 (SS-0698.0)	A display capable of displaying PSR, SSR and combiner radar data together with PSR signal processor data shall be provided for maintenance purposes at each radar site	X	X	4.4.1.15 4.4.2.2	4 5
0699.0	3.5.4 (SS-0699.0)	A raster scan type display shall be provided		X	4.4.2.2	4
0700.0	3.5.4 (SS-0700.0)	It shall be possible to select the various ranges, PSR, SSR, combiner and signal processor input signals by means of selector switches or equivalent		X	4.4.2.2	4
0702.0	3.5.4 (SS-0702.0)	Display formats for A scope, B scope and PPI shall be provided	X	X	4.4.1.15 4.4.2.2	4 5
0703.0	3.5.4 (SS-0703.0)	Subsystem test points signals shall be selectable for display in one or more of the specified display formats as follows: a. PSR plot processor output reports (either PPI or B scope) b. PSR track processor output reports (either PPI or B scope) c. PSR edited targets (either PPI or B scope) d. SSR plot extractor output reports (either PPI or B scope) e. Combiner output (either PPI or B-scope) f. Signal Processor data: 1. Target channel test points per Figure 3-10 2. Weather channel test points per Figure 3-11 3. Preprogrammed test points per Figure 3-12	X	X	4.4.1.15 4.4.2.2	4 5
0704.0	3.5.4 (SS-0704.0)	Pan and zoom capabilities shall be provided for each display format		X	4.4.2.2	4
0705.0	3.5.4 (SS-0705.0)	Panning shall have the capability of offsetting the PPI to any range/ azimuth area at maximum zoom		X	4.4.2.2	4
0706.0	3.5.4 (SS-0706.0)	The SDP shall provide a data list with range and azimuth identified for all non vector data items to be displayed on PPI or B scope formats		X	4.4.2.2	4
0707.0	3.5.4 (SS-0707.0)	The SCDI display software shall convert the list data to X-Y coordinates and display in the selected PPI or B scope format		X	4.4.2.2	4
0708.0	3.5.4 (SS-0708.0)	The PPI and B scope display of the list data shall be updated at a rate compatible with the rate of change of data		X	4.4.2.2	4
0710.0	3.5.4 (SS-0710.0)	The A scope display of vector data shall be updated at a minimum rate of 30 Hz		X	4.4.2.2	4
0711.0	3.5.4 (SS-0711.0)	The fixed azimuth A scope display shall be updated each time the scan passes the operator selected azimuth		X	4.4.2.2	4
0712.1	3.5.4 (SS-0712.1)	The adaptive target STC and clutter map shall be updated at least once every four to five scans.		X	4.4.2.2	4
0713.0	3.5.4 (SS-0713.0)	The weather map shall be updated when the integration cycle is complete (every six scans)		X	4.4.2.2	9

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
0714.0	3.5.4 (SS-0714.0)	Preprogrammed data does not have to keep up with the scanning of the radar but shall be read from the disk each time the operator makes a request.	X	X	4.4.1.15 4.4.2.2	4 5
0715.0	3.5.4 (SS-0715.0)	Display of this data shall be available for all online and maintenance roles/modes of the radar equipment	X	X	4.4.1.15 4.4.2.2	4 5
0717.0	3.5.4 (SS-0717.0)	The display shall provide a cursor		X		4
0718.1	3.5.4 (SS-0718.1)	The PPI cursor shall be calibrated in R, theta coordinates.		X	4.4.2.2	4
0720.0	3.5.4 (SS-0720.0)	Using the cursor, it shall be possible to delineate any sector which can be expanded to full resolution		X	4.4.2.2	4
0721.1	3.5.4 (SS-0721.1)	It shall be possible to offset the center of the display to any position delineated by the cursor		X	4.4.2.2	4
0722.0	3.5.4 (SS-0722.0)	The display shall be capable of displaying 900 synthetic targets		X	4.4.2.2	4
0723.1	3.5.4 (SS-0723.1)	It shall be possible to display alphanumeric data associated with up to 500 tracks (e.g., speed, heading, Mode 3/A code, altitude, etc).		X	4.4.2.2	4
0724.0	3.5.4 (SS-0724.0)	This data shall be displayed for all tracks, for no tracks, and for specific tracks which may be selected by cursor position. The use of color or unique symbols to more easily identify different target types is required.		X	4.4.2.2 4.4.2.5	4 8
0725.0	3.5.4 (SS-0725.0)	It shall be possible to display a history trail for each target		X	4.4.2.2	4
0726.0	3.5.4 (SS-0726.0)	The history trail shall be selectable as either infinite length, six scans, or off		X	4.4.2.2	4
0727.0	3.5.4 (SS-0727.0)	A clear screen function shall be provided. A facility to produce a hard copy of the display can be provided.		X	4.4.2.2	4
0729.0	3.5.4 (SS-0729.0)	It shall be possible to continuously transfer to magnetic media the data that is being displayed on the display screen		X	4.4.2.2	4
0730.0	3.5.4 (SS-0730.0)	It shall then be possible to replay stored data back to the display screen		X	4.4.2.2	4
0731.0	3.5.4 (SS-0731.0)	It shall also be possible to record snapshots of the display screen onto the magnetic media and subsequently replay to the display screen		X	4.4.2.2	4

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0732.7	3.5.5 (SS-0732.7) 3.5.5 (SRD)	The DASR shall provide the following performance monitoring capabilities: a. The following search and beacon RTQC targets are required in accordance with ICD SE007-3: 1. Search RTQC (SRTQC) uncorrelated test target 2. SRTQC correlated test target 3. Beacon RTQC (BRTQC) Test Target b. Provide up to 25 individual moving target indicator (MTI) reflectors, depending on the number of permanent echoes selected, for establishing the centerline of the runways and known geographical reference points required for radar surveillance approaches. The number of MTI reflectors is operator selectable by selecting a variable sit parameter (VSP). c. Provide a MSSR remote system monitor (MRSM) consisting of redundant ground based transponders and antennas included as an integral part of the beacon monitoring function at each site, reply to Modes-3/A, B and C specified in FAA-Order01010.51A, and permit the introduction of a calibrated variable range delay.	X	X	4.4.1.15 4.4.2.2	4 5
0732.1	3.5.5.a.1 (SS-0732.1) 3.5.5.a (SRD)	The PSR shall output an internally generated RTQC (SRTQC) uncorrelated once per scan	X	X	4.4.1.8 4.4.1.9 4.4.2.2	1 4
0732.2	3.5.5.a.1 (SS-0732.2) 3.5.5.a (SRD)	The formatted message shall include position, characteristic and unique (SRTQC) ID information		X	4.4.2.2	4
0732.3	3.5.5.a.1 (SS-0732.3) 3.5.5.a (SRD)	The SRTQC range and azimuth position shall be programmable anywhere within the instrumented volume		X	4.4.2.2	4
0732.4	3.5.5.a.2 (SS-0732.4) 3.5.5.a (SRD)	The PSR shall pass the uncorrelated RTQC test target through the track process and output a formatted correlated search RTQC message once per scan at the same location but with a unique ID		X	4.4.2.2	4
0732.5	3.5.5.a.3 (SS-0732.5) 3.5.5.a (SRD)	The MSSR shall output an internally generated RTQC (BRTQC) message once per scan	X	X	4.4.1.8 4.4.1.9 4.4.2.2	1 4
0732.6	3.5.5.a.3 (SS-0732.6) 3.5.5.a (SRD)	The message shall be formatted the same as a beacon report message but with a unique (BRTQC) ID		X	4.4.2.2	4
0733.0	3.5.6 (SS-0733.0)	On initial application of power to the MSSR and PSR, these equipments shall independently perform a startup diagnostic sequence prior to assuming an online role	X	X	4.4.1.15 4.4.2.2	4 5
0734.0	3.5.6 (SS-0734.0)	Upon successful completion of these sequences, status and configuration of the equipments shall be reported to the RMS	X	X	4.4.1.15 4.4.2.2	4 5
0735.0	3.5.6 (SS-0735.0)	In the event that a failure is detected by the startup sequence a diagnostic message shall be provided to the RMS	X	X	4.4.1.15 4.4.2.2	4 5

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
0736.0	3.5.6 (SS-0736.1)	The equipments shall assume an operational role within seven minutes of application of power for external temperatures from -5 degrees Celsius to +70 degrees Celsius. Where equipments have been cold soaked (e.g. no power available on site) at temperatures below -5 degrees to -50 degrees Celsius the start-up time will be 60 minutes to allow for pedestal pre-heating.		X	4.4.2.2	4
0737.0	3.5.6 (SS-0737.0)	This requirement shall be met for any order or regime of turn on sequences (e.g., one channel or two channels at a time and after power interruptions)		X	4.4.2.2	4
0738.0	3.5.7 (SS-0738.0)	Once powered on, no further action shall be required to make serviceable equipment operational		X	4.4.2.2	4
0739.0	3.6 (SS-0739.0) 3.6 (SRD)	The ASR-11 system shall be designed to provide system external interfaces to the following subsystems in accordance with Interface Requirement Documents (IRDs) and Interface Control Documents (ICDs): a. Existing automation systems (ARTS II, ARTS III, (including DBRITE, and PIDP) b. Standard terminal automation replacement system (STARS) c. NIMS proxy agent.	X		4.4.1.1 4.4.1.2 4.4.1.3	6
0740.3	3.6.1 (SS-0740.3) 3.6.1 (SRD) 3.a.5.a (ORD)	The ASR-11 shall provide four digital data ports to provide independent outputs simultaneously in any combination of the formats listed below: a. Modified Common Digitizer (CD-2) as defined in IRD NAS-IR-34032105 (STARS and existing automation systems) b. Digital Surveillance Format as defined in IRD "B" with the following surveillance messages output from the surveillance data translator: 1. ARTS-IIA - Protocol per CD-2 ICD SE007-4, section 3.2 2. ARTS-IIIA per Protocol SRAP ICD SE007-4, section 3.4 3. PIDP/DAIR per Protocol FSK - Tech. Order 31P-2T-32 4. Reconstituted search and beacon video as defined in IRD "B" 1.2.2.3., 1.2.2.4 c. ASTERIX as defined in NAS-IRD-34002105 (STARS)	X		4.4.1.1 4.4.1.2 4.4.1.3	6
0740.4	3.6.1 (SS-0740.4) 3.a.5.a (ORD)	The ASR-11 shall also be upgradeable to accommodate other automation systems in modified digitizer (CD-2) format as defined in IRD NAS-IR-34120001	X		4.4.1.4	6
0742.0	3.7.2 (SS-0742.0) 3.7.2 (SRD)	The ASR-11 system shall have an inherent availability (A_I) of 0.99999 during its useful life of at least 20 years under mission operating conditions of 24 hours per day with downtime for corrective and preventive maintenance as defined in this specification		X	4.4.2.3	4

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
0743.0	3.7.2 (SS-0743.0)	The Primary only (including weather) availability shall be 0.99984		X	4.4.2.3	4
0744.0	3.7.2 (SS-0744.0)	The SSR availability shall be 0.99998		X	4.4.2.3	4
0745.0	3.7.3 (SS-0745.0)	The ASR-11 system shall incorporate redundancy in transmitters, receivers, modems, transmission lines, and digital signal processors		X	4.4.2.1	4
0746.1	3.7.3 (SS-0746.1)	Redundant subsystems shall be reconfigurable automatically within 4 seconds.	X	X	4.4.1.15 4.4.2.1	4 5
0748.0	3.7.3 (SS-0748.0) 3.7.3 (SRD)	Antenna drive motors shall be redundant				
0749.0	3.7.4 (SS-0749.0) 3.7.4 (SRD)	Preventive maintenance shall be required no more than four times each year.		X	4.4.2.2	4
0750.0	3.7.4 (SS-0750.0)	The total time to complete these tasks shall not require more than twelve staff hours per year		X	4.4.2.2	4
0751.0	3.7.4 (SS-0751.0) 3.7.4 (SRD)	Preventive maintenance shall be done with the ASR-11 in the operational state and without degrading ASR-11 performance		X	4.4.2.2	4
0752.0	3.7.5 (SS-0752.0) 3.7.5 (SRD)	The ASR-11 system shall implement fault detection and isolation functions		X	4.4.2.1 4.4.2.2	4
0753.0	3.7.5 (SS-0753.0)	Fault detection and isolation shall detect and isolate faults as defined		X	4.4.2.1 4.4.2.2	4
0754.0	3.7.5 (SS-0754.0)	BIT/FI detection rates shall be ≥ 90% to an ambiguity group of 3 line replacement units or less using automatic mode		X	4.4.2.1 4.4.2.2	4
0755.0	3.7.5 (SS-0755.0)	BIT/FI detection rates shall be ≥ 95% to one LRU using automatic and manual modes		X	4.4.2.1 4.4.2.2	4
0756.0	3.7.5 (SS-0756.0)	Troubleshooting, using all available means, shall achieve 100% fault isolation capability for all failures not detected and faults isolated to a single LRU using BIT/FI		X	4.4.2.1 4.4.2.2	4
0760.0	3.7.6 (SS-0760.0)	The system ASR-11 system MTBCMA shall be ≥ 1070 hours		X	4.4.2.3 4.4.2.2	4
0761.0	3.7.7 (SS-0761.0) 3.7.7 (SRD)	The system ASR-11 system MTTR shall be ≤ 30 minutes, as tested in accordance with MIL-STD-470B, maintainability Program for Systems and Equipment.		X	4.4.2.1 4.4.2.2 4.4.2.3	4

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0762.0	3.8.1 (SS-0762.0)	The ASR-11 system shall meet all its functional and performance requirements under the environmental conditions below: a. Operating installed in controlled environment: 1. Temperature (°C): +10 to +40 2. Relative Humidity (%): 30 to 80 3. Altitude (Above Sea Level (ASL)): 0 to 10,000 feet b. Survival without damage (non-operating, installed indoors): 1. Temperature (°C): -40 to +60 2. Relative Humidity (%): 5 to 100 3. Altitude (ASL): 0 to 10,000 feet c. Installed outdoors: 1. Temperature (°C): -50 to +70 (includes 18°C for solar) 2. Relative Humidity (%): 5 to 100 3. Altitude (ASL): 0 to 10,000 feet 4. Wind (knots): 0 to 85 operating, 0 to 125 non-operating 5. Ice Loading: Encased in 0.5 inch radial thickness clear ice				
0765.0	3.8.2 (SS-0765.0)	The external ASR-11 mechanical equipment shall sustain no physical damage or degradation in performance when subjected to wind and rain under the following conditions: a. Operational: A 1-hour average rain rate of 100 mm per hour with a maximum wind speed of 35 knots b. Non-operational: A 1-hour average rain rate of 130 mm per hour with a wind speed of 64 knots, a 12-hour average rain rate of 70 mm per hour with a wind speed of 50 knots, and a 24-hour average rain rate of 18 mm per hour with a wind speed of 41 knots				
0766.0	3.8.3 (SS-0766.0)	For exterior painted surfaces of the antenna, the color shall be international orange, Color 12197 per FED-STD-595B except for radiating elements				
0767.0	3.8.4 (SS-0767.0) 3.8.4 (SRD)	Noise levels generated by the system shall be maintained at a level consistent with current Occupational Safety and Health Agency (OSHA) regulations, as specified in CFR Title 29, Part 1910		X	4.4.2.2 4.4.2.5 4.4.2.6	7 8
0768.0	3.8.4.1 (SS-0768.0)	Noise from the ASR-11 system equipment located in operational areas shall no exceed 55 dB (A) ambient at any time.		X	4.4.2.2 4.4.2.5 4.4.2.6	7 8
0768.1	3.8.4.1 (SS-0768.1)	In the event that ASR-11 radar electronics are located in an operational area, the electronics shall be isolated so that no personnel in the operational area are exposed to more than 55 dBA audible noise		X	4.4.2.2 4.4.2.5 4.4.2.6	7 8

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0769.0	3.8.4.2 (SS-0769.0)	Noise from the ASR-11 system equipment located in general work areas shall meet MIL-STD-1472, para 5.8.3.3.1 (≤ 75 dBA) in front of the equipment cabinets for equipment doors on and for equipment doors off		X	4.4.2.2 4.4.2.5 4.4.2.6	7 8
0770.0	3.8.4.3 (SS-0770.0)	The antenna pedestal with its drives, mounted on its tower, shall not produce noise levels in excess of 55 dBA outdoors on the ground at a distance of 100 ft from the tower		X	4.4.2.2 4.4.2.5 4.4.2.6	7 8
0771.0	3.8.5 (SS-0771.0) 3.8.5 (SRD)	The system shall meet the following radiation requirements: a. X-ray radiation less than 2 milliroentgen per hour at all times in any areas where normal maintenance is performed both inside and outside cabinets b. Electromagnetic radiation will not exceed the permissible exposure limits specified in FAA Order 3910.3A, Paragraph 33		X	4.4.2.6	7
0772.0	3.9 (SS-0772.0)	All RAM and non-volatile memory capacity and processor throughput shall be capable of being upgraded by at least 50% with only minor hardware modifications and software changes				
0773.0	3.10 (SS-0773.0) 3.10 (SRD)	For existing automation systems and STARS, the ASR-11 shall provide dual redundant modem systems to interface with the terminal radar control facilities (TRACON), ATC tower, and in some cases air route traffic control centers (ARTCCs).	X		4.4.1.1 4.4.1.2 4.4.1.3	6
0774.0	3.10 (SS-0774.0) 3.10 (SRD)	External transmission modem/router systems for the NIMS interface shall be provided as defined in NIMS-IR-G709906.				
0775.0	3.12 (SS-0775.0) 3.12 (SRD)	The ASR-11 system design and installation shall allow for a transition period between the existing system and the new ASR-11 system	X		4.4.1.1 4.4.1.2 4.4.1.18	4 6
0776.0	3.12 (SS-0776.0) 3.12 (SRD)	Transition switchover shall include all required functions necessary to return the site to a fully operational status, and take no longer than five minutes to complete	X	X	4.4.2.2 4.4.1.18	4 6
0777.0	3.13 (SS-0777.0)	All ASR-11 equipments, including system electronic equipment, antennas, pedestal, towers, and shelters shall be capable of being transported on both Interstate and conventional highways				
0778.0	3.13 (SS-0778.0)	Load plus vehicle width shall not exceed 12 feet				
0779.0	3.13 (SS-0779.0)	Load plus vehicle height shall not exceed 14 feet				
0780.0	3.13 (SS-0780.0)	Load plus vehicle length shall not exceed 40 feet				
0781.0	3.13 (SS-0781.0)	Each transported unit shall be configurable for transportation by standard trucks or tractors commonly used in the trucking industry				
0782.0	3.13 (SS-0782.0)	Each transported unit shall conform to the weight limits imposed by Highway authorities for road transportation throughout the CONUS				

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
0783.0	3.13 (SS-0783.0)	Each transportable unit shall be configured to prevent damage due to shock and vibration transmitted to the equipment during transit				
0784.0	3.14 (SS-0784.0)	Equipment design for personnel safety shall be per OSHA as identified in Title 29 Part 1910 of the Code of Federal Regulations.		X	4.4.2.6	7
0786.0	3.14 (SS-0786.0)	Hazards to equipment shall be minimized by a design in accordance with FAA-STD-020		X	4.4.2.6	7
0787.0	3.14 (SS-0787.0)	Unintentional hazardous radiation shall not exceed the limits set out in ANSI C95.1		X	4.4.2.6	7
0787.1	3.14 (SS-0787.1)	The ASR-11 system shall comply with the following safety requirements: a. No single point of failure or human error will lead to a catastrophic (Category I) or critical (Category II) hazard b. The equipment configurations will protect personnel from inadvertent contact with voltages or currents capable of producing shock hazards c. Proper grounding will be incorporated into the design to prevent shock hazards during normal operation or maintenance d. Guards, safety barriers, and warning labels and notes will be provided as necessary to alert personnel of potential hazards e. Thermal protection will be provided to prevent personnel from contacting surfaces that could cause injury f. Items that exceed normal lifting capacity for a single person will have a warning label specifying that the item requires a two (or more) person lift or requires mechanical assistance g. The design, manufacture, test, operation, and maintenance will not require the use of asbestos, PCBs, ozone-depleting substances or other prohibited materials listed in 29 CFR 1910.1001 to 1910.1101 h. Included in the ASR-11 system design will be provisions to prevent: 1. Inadvertent mismating of connections 2. Equipment damage by using fail-safe devices 3. Equipment damage by using current and voltage overload devices i. The safety standards will be met as listed in the DOD/FAA FRD and the Mobile Radar Facilities Document (Appendix A to the FRD)		X	4.4.2.6	7
0788.0	3.15 (SS-0788.0)	All quality assurance practices shall be in accordance with ISO 9001 standards				
0789.0	3.15 (SS-0789.0)	System integration shall be inspected by quality assurance and testing will be witnessed by quality assurance per Raytheon standard policies to verify that the ASR-11 system is in compliance with site acceptance inspection and test procedures				

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0790.0	3.15 (SS-0790.0)	Upon receipt at the site all DASR/ ASR-11 subsystems shall be inspected for shipping damage and shortages				
0791.0	3.15 (SS-0791.0)	Critical integration processes shall be verified by an on-site QA representative as specified in the site integration and test procedure				
0792.0	3.15 (SS-0792.0)	Site acceptance test (SAT) shall be performed in accordance with the approved procedure				
0793.0	3.15 (SS-0793.0)	Site documentation shall be verified to be in accordance with the as-installed equipment	X	X	4.4.1.6 4.4.2.2	4
0794.0	3.15 (SS-0794.0)	QA approved and documented work instructions shall be used for all work (including re-work) on the system				
0815.0	A.1.1.2 (SS-0815.0)	The RMS shall allow the same control and monitoring capability of the ASR-11 system from any operator maintenance terminal (OMT) or NIMS proxy agent.	X	X	4.4.1.15 4.4.2.2	4 5 6
0818.1	A.1.2 (SS-0818.1)	The RMS shall perform the following control, monitoring, and troubleshooting functions (either locally or remotely): a) Control of ASR-11 system operational functions and adjustable parameters b) Monitor, collect, and process performance and status data to determine if the ASR-11 system is operating within specified limits defined in the SRD c) Provide alarms, alerts, and status of system elements needed for operation (e.g. PSR and SSR electronics, HVAC, backup power systems, system security and safety control systems d) Perform fault isolation and diagnostic tests on the ASR-11 system to isolate failures per SRD 3.7.5	X	X	4.4.1.6 4.4.1.15 4.4.2.2 4.4.2.6 4.4.2.7	4 5 7
0819.0	A.1.2.e (SS-0819.0)	Loss of remote maintenance monitoring connectivity shall not cause loss of radar data to automation systems.	X	X	4.4.1.1 4.4.1.2 4.4.1.3 4.4.1.4 4.4.1.15 4.4.2.2	4 5 6
0820.0	A.1.2.f (SS-0820.0)	No remote monitoring subsystem function in the maintenance mode shall cause loss of radar data to automation.	X	X	4.4.1.1 4.4.1.2 4.4.1.3 4.4.1.4 4.4.1.15 4.4.2.2	4 5 6
0821.1	A.1.2.1 (SS-0821.1)	The RMS shall execute control functions and operator parameter adjustment commands upon receipt of commands from either an operator maintenance terminal, NIMS proxy agent or a radar control panel within an average time of two seconds and a maximum time of five seconds from the time the RMS receives a control command.	X	X	4.4.1.15 4.4.2.2	4 5 6

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0822.1	A.1.2.1 (SS-0822.1)	The local and remote OMT's and NIMS proxy agent shall be able to control DASR System functions and operator parameters. The remote monitoring subsystem through the OMTs at the originating site inherently validates all commands and restricts operator actions automatically if a command is disallowed.	X	X	4.4.1.15 4.4.2.2	4 5 6
0825.1	A.1.2.1 (SS-0825.1)	At a minimum, the following functions shall be included upon receipt of the appropriate valid command: a) Change, including initialization and reset, operator adjustable parameters, including mode of operation and system configuration b) Change, from local Site only, parameter threshold values that are adjustable c) Initiate diagnostics routines to isolate faults d) Where applicable, reset a ASR-11 subsystem or part of a subsystem e) Disable/enable alarm or alert indications (OMT & NIMS proxy agent only).	X	X	4.4.1.6 4.4.1.15 4.4.2.2	4 5 6
0826.1	A.1.2.2.1 (SS-0826.1)	At periodic intervals, the RMS shall monitor, execute measurements, and collect hardware and software critical performance data of the ASR-11 system to determine whether each subsystem (e.g. PSR, SSR, HVAC, backup power system, and facility) is operating within specified limits	X	X	4.4.1.6 4.4.1.15 4.4.2.2	4 5
0827.0	A.1.2.2.2 (SS-0827.0)	The RMS shall monitor and collect operating status and built-in-test results, including those of system configuration, mode of operation, and facilities equipments.	X	X	4.4.1.6 4.4.1.15 4.4.2.2	4 5
0828.0	A.1.2.2.3.a (SS-0828.0)	The collection of performance and status data shall be performed every status (1+/- 0.5 seconds) without a need for an external command	X	X	4.4.1.6 4.4.1.15 4.4.2.2	4 5
0829.0	A.1.2.2.3.b (SS-0829.0)	Collected status data shall be used by the local site remote monitoring subsystem to determine and remotely distribute the equipment status for each element of the DASR System. Remote terminal data is distributed once per cycle (1 +/- 0.5 seconds).	X	X	4.4.1.6 4.4.1.15 4.4.2.2	4 5
0830.0	A.1.2.2.3.c (SS-0830.0)	The performance status data collected shall be used by the remote monitoring system to determine system operability	X	X	4.4.1.15 4.4.2.2	4 5
0831.1	A.1.2.3 (SS-0831.1)	The remote monitoring subsystem shall determine and report alarm and alert status of the ASR-11 equipment for parameters that are required to maintain continuous ASR-11 system operation.	X	X	4.4.1.15 4.4.2.2	4 5
0833.0	A.1.2.3.d (SS-0833.0)	The RMS shall report alarms and alerts based on the set thresholds for conditions which affects critical system performance or data integrity as determined by the contractor and approved by the Government	X	X	4.4.1.15 4.4.2.2	4 5
0834.0	A.1.2.3.1.a (SS-0834.0)	The RMS shall perform a discriminating function to minimize the declaration of alarms and alerts caused by transient conditions	X	X	4.4.1.15 4.4.2.2	4 5

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
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0835.0	A.1.2.3.1.b (SS-0835.0)	The remote monitoring subsystem shall check every performance parameter value for an alarm or an alert condition at least once during a general status cycle and automatically report any and all alarm or alerts discovered	X	X	4.4.1.15 4.4.2.2	4 5
0836.1	A.1.2.3.1.c (SS-0836.1)	The remote monitoring subsystem shall monitor and check numeric performance parameter values, detect out of tolerance values, and report out of tolerance events (alarm or alert).	X	X	4.4.1.15 4.4.2.2	4 5
0837.0	A.1.2.3.1.d (SS-0837.0)	All out-of-tolerance and status conditions identified as alarms and alerts shall be reported immediately and time tagged and stored in order of occurrence	X	X	4.4.1.6 4.4.1.15 4.4.2.2	4 5
0838.0	A.1.2.3.2 (SS-0838.0)	The RMS shall automatically generate a system notification message with a return to normal indication for each applicable parameter previously reported as an alarm or alert when it is no longer in either the alarm or alert state (normal operating range)	X	X	4.4.1.6 4.4.1.15 4.4.2.2	4 5
0839.1	A.1.2.4 (SS-0839.1)	The RMS shall initiate fault isolation and diagnostic routines of the ASR-11 system to isolate system failures to the lowest replaceable unit level, as per the system specification par. 3.7.5, under control of an operator maintenance terminal or a NIMS proxy agent.	X	X	4.4.1.15 4.4.2.2	4 5 6
0840.0	A.1.2.4.a (SS-0840.0)	The RMS shall initiate the appropriate diagnostic routine automatically on fault detection, and will execute the command by directing the diagnostic test, collect and analyze the data, and format and send a response to the operator maintenance terminals and NIMS proxy agent.	X	X	4.4.1.15 4.4.2.1 4.4.2.2	4 5 6
0841.0	A.1.2.4.b (SS-0841.0)	The RMS shall permit the termination of fault isolation and maintenance tests at any time by maintainer action from an OMT or NIMS proxy agent.	X	X	4.4.1.15 4.4.2.2	4 5 6
0841.1	A.1.2.4.c (SS-0841.1)	The RMS shall be able to initiate manual fault isolation on a channel placed in maintenance by the RMS or placed in maintenance by an operator at an OMT or NIMS proxy agent. Results of manual fault isolation are only sent out to the originator.	X	X	4.4.1.15 4.4.2.1 4.4.2.2	4 5 6
0842.0	A.1.3 (SS-0842.0)	The RMS shall provide security measures to protect the integrity of the ASR-11 system	X	X	4.4.1.15 4.4.2.2 4.4.2.7	4 5 7
0843.1	A.1.3.a (SS-0843.1)	Control access to the RMS through an operator maintenance terminal or the NIMS proxy agent shall be permitted only: in response to a valid log-on procedure, based on a valid user ID in conjunction with a unique code word.	X	X	4.4.1.15 4.4.2.2 4.4.2.7	4 5 7

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0844.1	A.1.3.b (SS-0844.1)	The RMS shall log off an attached operator maintenance terminal or NIMS proxy agent and return to a no controller mode when the operator maintenance terminal or NIMS proxy agent in control has been inactive after a VSP time-out period.	X	X	4.4.1.15 4.4.2.2 4.4.2.7	4 5 7
0844.2	A.1.3.c (SS-0844.2)	Each OMT or NIMS proxy agent shall provide for the disabling of automatic log off. The default power-up state for the local OMTs will be Automatic Log Off - Disabled, and for all remote OMT's and the NIMS proxy agent it will Automatic Log Off - Enabled.	X	X	4.4.1.15 4.4.2.2 4.4.2.7	4 5 6
0845.1	A.1.4 (SS-0845.1)	The RMS shall notify (in one second +/- 0.5 seconds from detection) all connected OMTs and NIMS proxy agents when an operating mode or system configuration changes for the ASR-11 system. Changes to the operator adjustable parameters are registered at the originating OMT/SCDI or NIMS proxy agent.	X	X	4.4.1.6 4.4.1.15 4.4.2.2	4 5 6
0846.0	A.1.5 (SS-0846.0)	The local site RMS shall maintain initialization tables, threshold values, parameter state values, adjustable parameter values and equipment status and performance data	X	X	4.4.1.15 4.4.2.2	4 5
0847.1	A.1.5.a (SS-0847.1)	Equipment status and performance data shall include all critical performance parameter data, including certification data, the past history of alarms and alerts with a time and date tag for each entry.	X	X	4.4.1.15 4.4.2.2	4 5
0848.1	A.1.5.b (SS-0848.1)	The stored data shall be configured in such a way that an individual group or category of data can be recalled separately when requested by an OMT.	X	X	4.4.1.15 4.4.2.2	4 5
0849.1	A.1.5.1 (SS-0849.1)	Applicable ASR-11 equipment parameter values collected and stored by the RMS (e.g. alarms, alerts, and certification parameter values) shall be retrievable through commands issued to the RMS by the MPS, or through commands entered from an OMT when connected to the RMS in the local mode	X	X	4.4.1.15 4.4.2.2	4 5 6
0850.1	A.1.6 (SS-0850.1)	The RMS shall be able to operate in four modes of communications in response to commands issued through an OMT or the NIMS proxy agent.	X	X	4.4.1.15 4.4.2.2	4 5 6
0851.0	A.1.6 (SS-0851.0)	The switch from one mode to another shall occur within an average time of 1 second and a maximum time of 3 seconds	X	X	4.4.1.15 4.4.2.2	4 5
0853.1	A.1.6.a (SS-0853.1)	A single remote operator maintenance terminal, NIMS proxy agent or radar control panel is control of RMS functions, however, status and performance data shall be made available to all other OMTs, NIMS proxy agent, and radar control panels.	X	X	4.4.1.15 4.4.2.2	4 5 6

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0854.1	A.1.6.b (SS-0854.1)	The radar site local operator maintenance terminal is in control of RMS functions and in this mode, the Local Site remote monitoring subsystem shall continue to supply status data to all other OMTs, NIMS proxy agent, and radar control panels.	X	X	4.4.1.15 4.4.2.2	4 5 6
0854.3	A.1.6.c (SS-0854.3)	When no radar control panel or an operator maintenance terminal has control, system control shall be given to the first radar control panel that requests it or to the first remote OMT or NIMS proxy agent that provides a valid user/password combination.	X	X	4.4.1.15 4.4.2.2	4 5 6
0855.0	A.1.7 (SS-0855.0)	The RMS software shall provide menus containing all information necessary for maintenance personnel to control the RMS or obtain data from the RMS using an operator maintenance terminal.	X	X	4.4.1.15 4.4.2.2	4 5
0856.0	A.1.8 (SS-0856.0)	The RMS shall have the interfaces listed in paragraph A.1.8				
0857.3	A.1.8.a (SS-0857.3)	The ASR-11 shall have the capability to use a digital data service leased line interface to connect the 10 Base-T LAN to a remote NIMS proxy agent.				
0860.0	A.1.8.c (SS)	Modems/routers for the RMS NIMS interface shall conform to the requirements in NIMS-IR-G709906.				
0862.0	B.1.1 (SS-0862.0)	The Surveillance Data Translator (SDT) shall provide reconstituted analog video and reformatted digital data from the ASR-11 system in acceptable forms for use in the present ATC automation systems and consists of: a. The SDT b. A control and maintenance console. c. The digital video generator d. The SDT/DVG 10 Base T Hub.	X	X	4.4.2.1 4.4.1.1 4.4.1.2	6
0864.0	B.1.1 (SS-0864.0)	The SDT will be located in the terminal radar control (TRACON) facility equipment room, and will be controllable from this location.	X		4.4.1.1 4.4.1.2	6
0865.0	B.1.1 (SS-0865.0)	The SDT shall be housed within a single cabinet.	X		4.4.1.1 4.4.1.2	6
0866.0	B.1.1 (SS-0866.0)	The size of the cabinet for the SDT shall be minimized.	X		4.4.1.1 4.4.1.2	6
0867.0	B.1.2.1.a (SS-0867.0)	The SDT processor shall accept beacon, radar/beacon merged, uncorrelated search only, and correlated search target reports.	X		4.4.1.1 4.4.1.2	6
0868.0	B.1.2.1.b (SS-0868.0)	The SDT processor shall accept the sector mark timing message reports from the ASR-11 system for use in synchronization and generation of synthetic azimuth reference pulses and azimuth change pulses.	X		4.4.1.1 4.4.1.2	6
0869.0	B.1.2.1.c (SS-0869.0)	The SDT processor shall accept six-level weather contour digital reports from the surveillance radar and quantize these in weather cells with a resolution of 1/2 nmi by 1.4 degrees. The weather video is output at two intensity levels from the six level inputs.	X		4.4.1.5 4.4.1.1 4.4.1.2	6 9

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
0870.0	B.1.2.1.d (SS-0870.0)	The SDT processor shall accept the ASR-11 system status messages, include the SDT status, and send them all to the ATC computers in the ARTS automation systems as needed.	X		4.4.1.1 4.4.1.2	6
0871.0	B.1.2.2 (SS-0871.0)	The SDT processor shall include the ARTS IIA, ARTS IIIA, PIDP, and digital to reconstituted video interfaces.	X		4.4.1.1 4.4.1.2	6
0872.0	B.1.2.2.1 (SS-0872.0)	Serial output, to the ARTS IIA shall be conducted over two isolated interfaces each consisting of three RS-449/RS-422 communication links each operating at a minimum of 9600 bits per second.	X		4.4.1.1	6
0873.0	B.1.2.2.1 (SS-0873.0)	The serial digital interface format output shall be the same interface using common digitizer (CD) format as defined in ICD SE007-4, section 3.2.	X		4.4.1.1	6
0874.0	B.1.2.2.2 (SS-0874.0)	Parallel output, to the ARTS IIIA, shall be conducted over two isolated interfaces capable of transferring 10,000 32-bit words per second.	X		4.4.1.2	6
0875.0	B.1.2.2.2 (SS-0875.0)	The parallel digital interface format output shall be sensor receiver and processor (SRAP) format as defined in ICD SE007-4, section 3.4.	X		4.4.1.2	6
0876.0	B.1.2.2.3 (SS-0876.0)	Serial output into PIDP shall be FSK modulated 88 bit digital message format as defined in technical order 31P4-2T-32, "Video Signal Processor CP-1045/T."				
0877.1	B.1.2.2.4 (SS-0871.1)	Analog search, weather, and beacon video along with timing signals, triggers, azimuth pulses are reconstituted from the digital inputs and shall be available to the 12 ATC PPI displays, including DBRITE as required.	X	X	4.4.2.1 4.4.2.2 4.4.1.1 4.4.1.2 4.4.1.5	6 9
0878.0	B.1.2.2.4 (SS-0878.0)	Characteristics of the output signals, as measured at the output of the display processing function across 75 ohm termination shall meet the requirements of 3.5, 3.5.1, 3.5.2 and 3.5.3 of ICD SE007-4.	X		4.4.1.1 4.4.1.2	6
0879.0	B.1.2.2.4.1.1 (SS-0879.0)	The beacon and search target azimuth extent shall be separately maintenance selectable from 0.0879 degrees (one ACP) to 11.25 degrees (128 ACP) in 0.0879 degree steps over a 60 nmi range (search and beacon) based on increments not greater than 10 nmi and up to a maximum range of 120 nmi (beacon only) based on increments not greater than 20 nmi.	X	X	4.4.2.2 4.4.1.1 4.4.1.2	6
0880.1	B.1.2.2.4.1.1a (SS-0880.1)	Messages representing correlated search reports, radar and beacon merged reports, and uncorrelated search reports of selected quality, shall result in the full azimuth extent selected for the radar targets.	X		4.4.1.1 4.4.1.2	6
0881.0	B.1.2.2.4.1.1b (SS-0881.0)	Messages representing untracked targets shall result in an output at a binary fraction of the selected azimuth extent using 1/2 as the initial design fraction with the azimuth extent (i.e. slash or position indicator) centered on the target centroid.	X		4.4.1.1 4.4.1.2	6

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E I	OT&E O	SUBTEST PARAGRAPH	COI #
0882.0	B.1.2.2.4.1.2 (SS-0882.0)	The target range extent shall be maintenance selectable between 0.77 to 2.31 microseconds in 0.77 microsecond increments.	X	X	4.4.2.2 4.4.1.1 4.4.1.2	6
0883.1	B.1.2.2.4.1.2 a(SS-0883.1)	Messages representing correlated search reports, radar and beacon merged reports, and uncorrelated search reports of selected quality shall result in the full range extent selected for the radar targets.	X		4.4.1.1 4.4.1.2	6
0884.0	B.1.2.2.4.1.2 b (SS-0884.0)	Messages representing untracked radar targets shall result in an output at a binary fraction of the selected range extent using 1/2 as the initial design fraction.	X		4.4.1.1 4.4.1.2	6
0885.0	B.1.2.2.4.1.3 (SS-0885.0)	Each operator shall be able to select the individual type of search video for display by using the video display control unit at each PPI position. The beacon data is always displayed with azimuth extent set by the operator and distinguishable from that of the search display.	X	X	4.4.2.1 4.4.2.2 4.4.1.1 4.4.1.2	6
0886.0	B.1.2.2.4.1.3 a,b (SS-0886.0)	The DASR shall be capable (site selectable parameter) of displaying: a. Targets that have been scan-to-scan correlated over 100 percent of the detection volume. b. Targets that have not been scan-to scan correlated over 100 percent of the detection volume. c. A combination of all correlated and uncorrelated targets for site selectable regions.	X	X	4.4.2.1 4.4.2.2 4.4.1.1 4.4.1.2	6
0887.0	B.1.2.2.4.1.3 c (SS-0887.0)	All site selectable regions shall be adjustable in range and azimuth.	X	X	4.4.2.1 4.4.2.2 4.4.1.1 4.4.1.2	6
0889.0	B.1.2.2.4.1.4 a (SS-0889.0)	As a minimum, the video display control unit shall be able to select the individual type of search video for display.	X	X	4.4.2.1 4.4.2.2 4.4.1.1 4.4.1.2 4.4.1.15	4 5 6
0890.0	B.1.2.2.4.1.4 b (SS-0889.0)	As a minimum the video display control unit shall be able to select two intensity level weather information for display (discrete and summation).	X	X	4.4.2.1 4.4.2.2 4.4.1.1 4.4.1.2 4.4.1.15	4 5 6
0892.0	B.1.2.2.4.2 a (SS-0892.0)	The dual channels of the SDT shall be able to drive 12 displays in an arrangement that ensures a redundant path.	X	X	4.4.2.1 4.4.2.2 4.4.1.1 4.4.1.2	6
0893.0	B.1.2.2.4.2 b (SS-0893.0)	The redundant paths shall have separate power supplies.	X		4.4.1.1 4.4.1.2	6
0894.0	B.1.2.2.4.2 c (SS-0894.0)	The distribution function shall be isolated from the display processing function such that a failure or corrective maintenance action on a display processor function or power supply will not induce a shutdown or failure into any of the displays.	X	X	4.4.2.2 4.4.1.1 4.4.1.2	6

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
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0895.0	B.1.2.2.4.2 d (SS-0895.0)	The distribution function shall provide isolation and amplification as required to produce appropriate data at the end of any length of RG-59, or equal, cable up to a maximum of 300 feet.	X		4.4.1.1 4.4.1.2	6
0896.0	B.1.2.2.4.2 e (SS-0896.0)	The input impedance of each of the 12 display connections shall be sufficient such that up to two display connections can be removed without a change in any of the output signals to the displays.	X		4.4.1.1 4.4.1.2	6
0897.0	B.1.2.2.4.2 f (SS-0897.0)	All output connections shall provide sufficient isolation such that improper termination, ranging from short to open circuits on one or more outputs, will not cause damage to the remaining displays or be reflected in the outputs to the remaining displays.	X		4.4.1.1 4.4.1.2	6
0898.0	B.1.2.2.5 (SS-0898.0)	Beacon reconstituted video shall be in accordance with 3.6 of ICD SE007-4.	X		4.4.1.1 4.4.1.2	6
0899.0	B.1.2.3 (SS-0899.0)	The display processing function shall provide video, azimuth data and trigger alignment.	X		4.4.1.1 4.4.1.2 4.4.1.15	4 5 6
0900.0	B.1.2.3 a (SS-0900.0)	All analog search and beacon video output signals shall be time aligned at the correct range for simultaneous overlay viewing on the plan position indicator display.	X		4.4.1.1 4.4.1.2	6
0901.0	B.1.2.3 a (SS-0901.0)	Overall data delay from antenna boresight to DTE output of the analog target centroid, with position marker centered on the target on a video display (modem delay included) shall not exceed the data timing specified in par. 3.4.4.	X		4.4.1.1 4.4.1.2 4.4.1.3 4.4.1.4	6
0902.0	B.1.2.3.b (SS-0902.0)	Digital delays for the beacon and uncorrelated search data and sector marks will be set so that surveillance data shall be automatically sent immediately after the sector mark whose azimuth is just prior to the surveillance date true azimuth.	X		4.4.1.1 4.4.1.2 4.4.1.3 4.4.1.4	6
0903.0	B.1.2.3 b (SS-0903.0)	In no case shall the surveillance data be sent later than 22.5 degrees after the sector mark.	X		4.4.1.1 4.4.1.2 4.4.1.3 4.4.1.4	6
0904.0	B.1.2.3 c (SS-0904.0)	Operator adjustment shall be provided so that analog and digital data can be aligned in time on the display.	X	X	4.4.2.1 4.4.2.2 4.4.1.1 4.4.1.2 4.4.1.15	4 5 6
1018.0	3.0.h (FRD-0018.0)	ASR-11 facility systems shall be built in accordance with the personnel safety requirements of CFR Title 29, Part 1910, Occupational Safety and Health Agency (OSHA)		X	4.4.2.6	7
1020.0	3.0.j (FRD-0020.0)	Facilities equipment delivered shall be provided with control and monitoring requirements specified in the Remote Monitoring Subsystem (RMS) Interface Requirements Document IRD.	X		4.4.1.6	4

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
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1024.0	3.1.1.1 (FRD-0024.0)	The total floor space and equipment layout for each housing shall take into account human engineering and equipment accessibility, and provide working clearance and space as required by OSHA regulations and the National Electrical Code (NEC), National Fire Protection Association (NFPA) 70		X	4.4.2.5 4.4.2.6	7 8
1025.0	3.1.1.2 (FRD-0025.0)	The ASR-11 housing shall contain areas and cabinets suitable to accommodate all spare electronic components, line replaceable units, mechanical and electrical supplies, test equipment, instruction manuals, and other spares required to be maintained at the site.	X		4.4.1.6	7
1028.0	3.1.1.3.b (FRD-0028.0)	All doors shall be provided with gaskets to control air infiltration, closure hardware to prevent uncontrolled opening or closing of the door, with a latch arrangement to hold the door in the open position, and corrosion resistant fasteners, bolts, screws, and locks.		X	4.4.2.7	7
1029.0	3.1.1.3.c (FRD-0029.0)	Doors shall not have hinges that permit removal of the door from outside the housing.		X	4.4.2.7	7
1031.0	3.1.1.4 (FRD-0031.0)	All exterior doors shall be equipped with keyed locksets, equipped with heavy duty cylindrical locks, BEST Lock Company #83K-7D-A-S3-626		X	4.4.2.7	7
1032.0	3.1.1.4 (FRD-0032.0)	Four construction core master keys shall be provided for the site.		X	4.4.2.7	7
1033.0	3.1.1.4 (FRD-0033.0)	Each door shall be equipped with an "Open Door" alarm feature to permit remote monitoring	X	X	4.4.1.6 4.4.2.7	7
1036.0	3.1.1.6 (FRD-0036.0)	The DASR/ASR-11 housing shall be equipped with a telephone communication network to permit clear communications between the following locations as a minimum: technician's desk, OMT location, radar equipment test area, beacon equipment test area, power equipment area, and antenna tower mezzanine. Consolidation of locations on the network is acceptable if the housing layout permits logical common use.	X		4.4.1.6	8
1037.0	3.1.1.6 (FRD-0037.0)	The network shall comply with all requirements of NFPA 70 and ANSI c.2-93, and be interfaced to the external telephone system servicing the site.	X	X	4.4.1.6 4.4.2.6	7
1045.0	3.1.1.8 (FRD-0045.0)	Lighting shall be provided for all areas of the ASR-11 housing		X	4.4.2.5 4.4.2.6 4.4.2.7	7 8
1046.0	3.1.1.8.a (FRD-0046.0)	Interior lighting circuits shall use UL-approved fixtures, switches, and lamps with wiring that conforms to NFPA 70	X	X	4.4.1.7 4.4.2.6	
1048.0	3.1.1.8.c (FRD-0048.0)	Lighting shall produce at least 75 foot-candles (initial) and 50 foot-candles (maintained), of uniform, color-balanced illumination for each work area		X	4.4.2.5 4.4.2.6	7 8
1049.0	3.1.1.8.d (FRD-0049.0)	Each lighting circuit shall be supplied with its own on/off switch at each entrance		X	4.4.2.6	7
1050.0	3.1.1.8.e (FRD-0050.0)	Battery-powered interior emergency lighting shall be provided		X	4.4.2.6	7

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
1051.0	3.1.1.8.e (FRD-0051.0)	Emergency lighting shall automatically illuminate in the event power fails		X	4.4.2.6	7
1053.0	3.1.1.8.f (FRD-0053.0)	Continuously illuminated exit signs shall be provided, having an opaque background with red or green letters to be determined by each site		X	4.4.2.6	7
1054.0	3.1.1.9.a (FRD-0054.0)	Safety provisions for the housing shall be provided in accordance with applicable OSHA regulations		X	4.4.2.6	7
1055.0	3.1.1.9.b (FRD-0055.0)	High voltage warning signs shall be posted at locations required by NFPA 70		X	4.4.2.6	7
1056.0	3.1.1.9.c (FRD-0056.0)	Fire extinguishers shall be a minimum of 15 pound Type ABC dry chemical in accordance with NFPA-10 and located adjacent to all housing doors		X	4.4.2.6	7
1060.0	3.1.1.10 (FRD-0060.0)	A green insulated ground wire from the service disconnect switch shall be routed to each receptacle in accordance with FAA-STD-020b, paragraph 3.8.7	X		4.4.1.7	7
1064.0	3.1.1.11 (FRD-0064.0)	All conductors routed between the housing and the antenna tower shall be provided transient protection at the point of entry into the housing in accordance with FAA-STD-020b, paragraph 3.7	X		4.4.1.7	7
1065.0	3.1.1.11.a (FRD-0065.0)	Transient protection devices, tailored to the characteristics of the equipment being protected, and conforming to FAA-STD-019b, paragraph 3.7 or 3.8 as appropriate, shall be provided at all points of data, signal, control, or power wiring interfaces with the housing	X		4.4.1.7	7
1066.0	3.1.1.11.b (FRD-0066.0)	A grounded bulkhead plate shall be provided at the exterior housing wall at each point where antenna tower waveguide, coax, or cabling penetrates the wall.	X		4.4.1.7	7
1067.0	3.1.1.11.b (FRD-0067.0)	Waveguide, coaxial cable shields, and outer shields of cables shall be grounded at this point.	X		4.4.1.7	7
1070.1	3.1.1.11.d (FRD-0070.1)	Rigid conduit carrying conductors shall be terminated at and bonded to the exterior enclosure in accordance with FAA-STD-019b, FAA-STD-020b and FAA-C-1217e.	X		4.4.1.7	7
1078.0	3.1.2.1 (FRD-0078.0)	An HVAC system, appropriate to the prefabricated shelter use and in accordance with FRD section 3.2 shall be provided.	X		4.4.1.6	4
1087.0	3.1.3.1.a (FRD-0087.0)	The floor plan shall provide space to accommodate all ASR-11 system equipment, with working room meeting all safety requirements		X	4.4.2.6	7
1089.0	3.1.3.1.b (FRD-0089.0)	The housing shall be provided with adequate floor space to house the ASR-11 primary and secondary radar equipment, a monitor and control workstation, a UPS, any ancillary equipment required for the maintenance and operation of the ASR-11 system, and adequate storage for required maintenance equipment, spare parts, and maintenance and operation manuals		X	4.4.2.6	7

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			I	O		
1091.0	3.1.3.1.d (FRD-0091.0)	A work bench, with a work surface made of a material that prevents static discharges, integrated with the working design of the housing and suitable for electronic maintenance activities typical of this type of facility, shall be provided in the electronic equipment area, and include a minimum of two 120 V/20 amp polarized duplex electrical receptacles in accordance with NFPA 70		X	4.4.2.6	7
1096.0	3.1.3.1.g (FRD-0096.0)	Flooring shall have either a static non-generative surface, or a dissipating surface connected to the electronic multipoint ground system or counterpoise, in accordance with FAA-STD-019b, paragraph 3.16.7	X		4.4.1.7	7
1096.1	3.1.3.1.g (FRD-0096.1)	For sites which utilize configuration 4, a floor level multipoint ground, attached to the counterpoise, shall be established and have all dissipating floor surfaces connected to it if the dissipating floor is not directly tied into the counterpoise.	X		4.4.1.7	7
1100.0	3.1.3.1.i (FRD-0100.0)	A fire and smoke detection system, designed in accordance with NFPA 70 and NFPA 72, shall be integrated into the ASR-11 housing and RMS	X	X	4.4.1.6 4.4.2.6 4.4.2.7	7
1103.0	3.1.3.2.c (FRD-0103.0)	The housing shall contain a power distribution system for control of the housing power and the powering of the test equipment	X		4.4.1.7	7
1106.0	3.1.3.2.f (FRD-0106.0)	A work bench, integrated with the working design of the housing and suitable for mechanical maintenance activities typical of this type of facility, shall be provided inside the E-G housing with access to a minimum of two 120V/20 amp polarized duplex electrical receptacles, at bench height, in accordance with NFPA 70		X	4.4.2.6	7
1107.1	3.1.3.2.g (FRD-0107.1)	A fire and smoke detection system, designed in accordance with NFPA 70 and NFPA 72, shall be integrated into the E-G housing and interfaced to the ASR-11 RMS	X	X	4.4.1.6 4.4.2.6 4.4.2.7	7
1115.0	3.1.3.3.b (FRD-0115.0)	The enclosure shall have a single door of the same type as the radar electronics equipment housing and secured with a BEST Lock(s)		X	4.4.2.7	7
1117.0	3.2 (FRD-0117.0)	The ASR-11 system shall include an HVAC system, appropriate for the geographic location of the system, the type of housing, and the use of the housing, to enable the ASR-11 system to meet the reliability and availability requirements specified in the SRD	X		4.4.1.6	4

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
1118.0	3.2.a (FRD-0118.0)	The HVAC shall maintain the housing environment within the temperature and humidity range specified below, under all operating and environmental conditions anticipated to exist for each site, without exceeding 80% of the system's operational capacity: Electronics Equipment Housing: Temp (range): 52-88° F (11-31°C) Relative Humidity (max): 80% E-G and MRSM Housings: Temp (min): 50° F (10° C)	X		4.4.1.6	4
1120.0	3.2.c (FRD-0120.0)	Internal housing ductwork shall be provided to the location(s) of equipment supported in accordance with the ASHRAE Handbook, Fundamentals Volume, and based upon engineering estimates of the heat loads to be encountered from each item of equipment	X		4.4.1.6	4
1121.0	3.2.d (FRD-0121.0)	The HVAC systems supplied for the housing shall be provided with remote monitoring.	X		4.4.1.6	4
1122.0	3.2.1 (FRD-0122.0)	Filters shall be incorporated and mounted so that they can be readily examined and replaced, in order to prevent the intrusion of dust or other environmental contaminants into the equipment housing, and into equipment cabinets with independent ventilation systems	X		4.4.1.6	4
1123.0	3.2.1.a (FRD-0123.0)	Standard air filters shall conform to the recommendations of the ASHRAE Handbook, Systems Volume, filter air of particles larger than 5 microns, and support the concept of quarterly maintenance	X		4.4.1.6	4
1125.0	3.2.2 (FRD-0125.0)	The layout of the environmental control system shall not interfere with the normal operation, installation, or removal of any equipment within the housing	X		4.4.1.6	7
1126.1	3.2.4.a (FRD-0126.1)	For pre-engineered housings, and built-on-site housings, the basic HVAC system of equipment for the electronics equipment housing shall be composed of individually packaged pad-mounted units, incorporated into a dual-unit configuration.	X		4.4.1.6	4
1126.2	3.2.4.a (FRD-0126.2)	Each unit shall incorporate a design for two compressors and staged heating/cooling with delayed starting of one unit so as to limit motor inrush current requirements.	X		4.4.1.6	4
1127.0	3.2.4.a (FRD-0127.0)	The individual units provided shall be small enough to provide efficient operation on days that require little or moderate cooling or heating	X		4.4.1.6	4
1128.0	3.2.4.a (FRD-0128.0)	One unit shall be defined as the operating unit with the other as standby.	X		4.4.1.6	4
1129.0	3.2.4.a (FRD-0129.0)	The standby unit shall come on-line in the event of failure of the operating unit.	X		4.4.1.6	4
1131.0	3.2.4.a (FRD-0131.0)	The system shall allow for control of units so that operating time on all units can be balanced	X		4.4.1.6	4

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
1132.0	3.2.4.b (FRD-0132.0)	HVAC system controls shall provide for lead unit operation, with the equipment designated as lead to be remotely monitored	X		4.4.1.6	4
1133.0	3.2.4.c (FRD-0133.0)	The HVAC system design shall not contribute more than 65 dB(A) noise pressure to the aggregate ambient noise levels in the radar equipment room		X	4.4.2.5 4.4.2.6	7 8
1134.0	3.2.4.c (FRD-0134.0)	External components of the HVAC shall not produce noise levels in excess of 55 dB(A) ambient measured at a distance of 100 feet radially from the HVAC equipment		X	4.4.2.5 4.4.2.6	7 8
1135.0	3.2.4.d (FRD-0135.0)	The HVAC system shall incorporate controls to delay restarting and to sequentially restart individual units after a power failure to minimize surge currents	X		4.4.1.6	4
1136.0	3.2.4.d (FRD-0136.0)	The delayed and sequential restart feature shall not impact the operation or reliability of the ASR-11 system	X		4.4.1.6	4
1140.0	3.3 (FRD-0140.0)	The UPS equipment, in conjunction with the facility surge arrestor, shall accept commercial power variations without damage	X		4.4.1.7	7
1141.0	3.3 (FRD-0141.0)	The UPS equipment, in conjunction with the facility surge arrestor, shall stabilize both frequency and voltage of commercial and E-G power during normal operation, and suppress transient voltage conditions that may damage ASR-11 system equipment supplied by the critical power distribution system	X		4.4.1.7	7
1142.0	3.3.1.a (FRD-0142.0)	The UPS shall not create EMI/RFI that affects the operation of other ASR-11 system equipment	X		4.4.1.7	7
1143.0	3.3.1.b (FRD-0143.0)	UPS operation shall not be adversely affected by EMI/RFI, harmonic or noise content induced by other ASR-11 system equipment	X		4.4.1.7	7
1145.0	3.3.1.d (FRD-0145.0)	The output of the UPS equipment shall be configured as a separately derived source	X		4.4.1.7	7
1146.0	3.3.1.e (FRD-0146.0)	Distortion of input current waveforms attributed to the UPS shall not exceed 10% THD	X		4.4.1.7	7
1147.0	3.3.1.f (FRD-0147.0)	Switching transients associated with the UPS shall not adversely affect the operation of any other device	X		4.4.1.7	7
1149.0	3.3.1.h (FRD-0149.0)	UPS equipment shall supply conditioned power output when supplied with either commercial power, as defined in FRD paragraph 3.7, or E-G power as defined in 3.4	X		4.4.1.7	7
1150.0	3.3.1.i (FRD-0150.0)	The UPS shall be capable of providing continuity of power to the critical power distribution system for at least 5 minutes during a commercial power failure	X		4.4.1.7	4
1151.0	3.3.1.j (FRD-0151.0)	The UPS shall be sized to provide power for ASR-11 system equipment essential to providing ATC radar services, in the operational mode requiring the most power, plus 20%	X		4.4.1.7	4

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
1152.0	3.3.1.k (FRD-0152.0)	An isolation/bypass switch and associated circuitry shall be provided for the UPS to permit its total isolation from the power distribution system	X		4.4.1.7	7
1153.0	3.3.1.k (FRD-0153.0)	The isolation/bypass switch shall be operable without disrupting the critical power distribution	X		4.4.1.7	7
1154.0	3.3.2 (FRD-0154.0)	The UPS shall be configured for unattended operation	X		4.4.1.7	4
1155.0	3.3.2.a (FRD-0155.0)	The UPS shall incorporate an automatic bypass feature allowing immediate no-break return to the input power in the event of an internal UPS failure	X		4.4.1.7	7
1156.0	3.3.2.b (FRD-0156.0)	The UPS shall be capable of both manual and fully automatic operation, including fully automatic return to normal operation after a failure of commercial power has been restored	X		4.4.1.7	4
1157.0	3.3.3 (FRD-0157.0)	The UPS shall be provided with built-in test, fault isolation, and monitoring equipment to permit remote monitoring and control	X		4.4.1.7	4
1160.0	3.4 (FRD-0160.0)	The E-G set shall be selected to meet the total power requirements of each site with all equipment operating, including the most demanding mode of HVAC operation, and the UPS load while recharging batteries, plus 20%	X		4.4.1.7	4
1162.0	3.4.1.a (FRD-0162.0)	The E-G set shall not create EMI/RFI emissions that affect the operation of other facility equipment	X		4.4.1.7	7
1163.2	3.4.1.b (FRD-0163.1)	During steady state the engine-generator set shall maintain the following voltage and frequency control: Frequency, Regulation maximum deviation +/- 0.30 Frequency, Stability maximum deviation +/- 0.25 Voltage, Regulation maximum deviation +/- 2.00 Voltage, Stability maximum deviation +/- 1.00	X		4.4.1.7	4
1164.0	3.4.1.c (FRD-0164.0)	The engine-generator shall be provided with an Automatic Transfer Switch, which will sense any voltage increase or decrease of 10% or more, whether one or more phases, and automatically start the engine generator and assume the facility load with stable power as specified in paragraph 3.4.1.b within 10 seconds of the initiating event	X		4.4.1.7	4
1165.0	3.4.1.d (FRD-0165.0)	Phase loss protection for ASR-11 system equipment, with automatic reset, shall be incorporated as a standard feature of the engine-generator set automatic transfer switch.	X		4.4.1.7	7
1166.0	3.4.1.e (FRD-0166.0)	The engine-generator shall be equipped with monitoring and an emergency shutdown feature to protect the engine from damage or self-destruction	X		4.4.1.6	7
1167.0	3.4.1.f (FRD-0167.0)	If required by the engine-generator provided, hazardous noise level warning signs shall be posted in the engine-generator room or housing in accordance with applicable OSHA regulations		X	4.4.2.6	7
1168.0	3.4.1.g (FRD-0168.0)	External components of the engine-generator shall not produce noise levels in excess of 55 dB(A) ambient measured at a distance of 100 feet radially from the engine-generator equipment		X	4.4.2.5 4.4.2.6	7 8

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			I	O		
1169.2	3.4.2 (FRD-0169.2)	The engine-generator shall be provided with a bypass switch, operable without disrupting facility power, rated to handle 100% of the rated generator power output, and to permit isolating the engine-generator from the ASR-11 system electrical system to perform maintenance	X		4.4.1.7	7
1169.3	3.4.3 (FRD-0169.3)	A load bank shall be sized in accordance with the manufacturer's recommendations so that the engine generator set runs at an efficient load value that optimizes the engine temperature range to keep emissions and oil consumption held to their lowest value.	X		4.4.1.7	7
1170.0	3.4.3 (FRD-0170.0)	A load bank as described in 3.4.3 (1169.3), shall be provided for each site.	X		4.4.1.7	7
1171.0	3.4.3 (FRD-0171.0)	Installation shall be in accordance with the manufacturer's recommendations and FAA-E-2837a or FAA-E-2204d, as appropriate	X		4.4.1.7	7
1174.0	3.4.4.b (FRD-0174.0)	The fuel tank shall be a self-contained unit designed for above-ground installation, be installed in accordance with the manufacturer's recommendations, with FAA-C-1244a, Installation of Engine-Generators and Fuel Tanks, and with current federal, state, and local regulations	X		4.4.1.7	7
1175.0	3.4.4.c (FRD-0175.0)	Overfill and spill protection shall be provided in accordance with EPA 40 CFR Part 280, Technical Requirements	X	X	4.4.1.7 4.4.2.6	7
1176.0	3.4.4.d (FRD-0176.0)	Secondary leak protection (pipe-in-pipe) containment shall be provided for the fuel supply line between the tank and the engine, if the supply line is routed underground	X		4.4.1.7	7
1177.0	3.4.4.e (FRD-0177.0)	The tank shall be provided with a fuel fill inlet cap fitted for a Best Lock padlock		X	4.4.2.7	7
1181.0	3.4.6 (FRD-0181.0)	The engine-generator shall be provided with an exhaust system which is vented outside the housing		X	4.4.2.6	7
1182.0	3.4.6 (FRD-0182.0)	The installed system shall be designed and constructed to prevent leakage of exhaust gasses into the housing and to prevent blow back of exhaust gasses from soiling or defacing the housing, and be covered or guarded to protect personnel working on the system from burns		X	4.4.2.6	7
1183.0	3.4.6 (FRD-0183.0)	The exhaust system shall be grounded to the earth counterpoise	X		4.4.1.7	7
1184.0	3.4.7 (FRD-0184.0)	The engine-generator shall be provided with built-in control, test, and monitoring equipment to permit remote monitoring and control	X		4.4.1.6	4
1192.0	3.5.2.a (FRD-0192.0)	The tower shall be designed with OSHA-compliant access doors, stairs, work platforms, and hoists where and as appropriate to provide access for maintenance and replacement of tower and antenna elements		X	4.4.2.6	7
1193.0	3.5.2.b (FRD-0193.0)	A stairway shall be provided form the ground level to the top deck of the tower with landings at appropriate increments		X	4.4.2.6	7

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			I	O		
1194.0	3.5.2.c (FRD-0194.0)	The antenna deck shall provide safe working access for the antenna system and associated components		X	4.4.2.6	7
1195.0	3.5.2.d (FRD-0195.0)	A perimeter guardrail and toe board shall be provided around each working level of the tower and the access stairway		X	4.4.2.6	7
1197.0	3.5.2.e (FRD-0197.0)	The section of antenna deck immediately above the maintenance platform under the antenna pedestal, or mezzanine, shall be solid to shield the work area from precipitation		X	4.4.2.6	7
1198.0	3.5.2.f (FRD-0198.0)	Access to the antenna deck shall have a lockable door or hatch and fitted for Best Lock		X	4.4.2.7	7
1199.0	3.5.2.g (FRD-0199.0)	The antenna deck access shall be equipped with an interlock with manual over-ride that disables both the antenna drive motor and the radar transmitter, and have a prominent, OSHA approved, RF Radiation Hazard sign attached	X	X	4.4.1.6 4.4.2.6	7
1204.0	3.5.3 (FRD-0204.0)	A permanently mounted electrically-powered weatherproof hoist, conforming to OSHA regulations for safe operation and capable of lifting the heaviest/largest item that could feasibly be replaced (excluding the antenna pedestal and reflector assembly), shall be provided to transport equipment and tools from the ground onto the mezzanine inside of the guard rails	X	X	4.4.1.6 4.4.2.6	7
1206.0	3.5.4.a (FRD-0206.0)	Galvanized steel conduit, in accordance with FAA-C-1217e, shall be used for the routing of all cable, except for RF coaxial cable	X		4.4.1.7	7
1208.0	3.5.4.c (FRD-0208.0)	The conduit shall be bonded to the site counterpoise and the tower support structure in accordance with FAA-STD-019b, paragraph 3.11.5	X		4.4.1.7	7
1210.0	3.5.4.d (FRD-0210.0)	Vertical runs of RF coaxial cable and waveguide shall be accessible from the stairway to allow easier access for maintenance		X	4.4.2.6	7
1211.0	3.5.5 (FRD-0211.0)	Electrical signal and power cabling between the tower and the electronic equipment housing shall be in accordance with NFPA 70 and FAA-C-1217e	X	X	4.4.1.7 4.4.2.6	7

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
1214.0	3.5.6 (FRD-0214.0)	Lighting shall be provided in accordance with the following: a. A minimum illumination level of 5 foot-candles (initial), measured at the handrail height, for the tower stairs and landings. b. A minimum illumination level of 15 foot-candles (initial) for the working areas on the mezzanine level, measured at the handrail height, and at least 30 foot-candles (initial) within the tower pedestal room, measured at 3-ft. above floor level. c. Lighting for the antenna platform level to be provided in accordance with site-specific requirements. If lighting is required, a minimum average illumination of 20 foot-candles (initial), measured at the handrail height is required. d. Lights for the stairway controlled by a switch at the ground level and mezzanine level. Lights for the mezzanine and antenna platform level work areas controlled from switches at the mezzanine level and at the ground level. e. Two portable floodlights that provide at least 100 foot-candles of light, with electrical cords to permit their use at any location on the antenna deck, for temporary illumination of the antenna and pedestal. f. Light fixtures shall be physically installed so that lamps can be replaced by a single person without requiring special equipment.		X	4.4.2.5 4.4.2.6 4.4.2.7	7 8
1215.0	3.5.6.f (FRD-0215.0)	Light fixtures shall be physically located so that lamps can be replaced by a single person without requiring special equipment		X	4.4.2.6	7
1216.0	3.5.7 (FRD-0216.0)	Towers or other supports required to mount the MRSM antenna shall be provided to conform to best commercial practices, and designed to meet the same wind loading and associated environmental conditions required for the ASR-11 antenna system	X		4.4.1.6	4
1223.0	3.7.a (FRD-0223.0)	Cabling from the pad mounted transformer to the ASR-11 system housing shall be via underground ferrous conduit, per FAA-STD-019b, paragraph 3.2.3. Direct burial of this cable is not permitted.	X		4.4.1.7	7
1224.0	3.7.a (FRD-0224.0)	Conduit joints and fittings shall be electrically continuous with bonding resistance less than 5 mΩ between joined parts	X		4.4.1.7	7
1225.0	3.7.a (FRD-0225.0)	Conduit enclosing service entrance conductors shall be terminated using conductive fittings to the distribution transformer case and the service equipment housing	X		4.4.1.7	7
1226.0	3.7.a (FRD-0226.0)	At each location where conduits first penetrate the housing or building's exterior wall, direct connections shall be made to the counterpoise	X		4.4.1.7	7

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
1229.0	3.7.d (FRD-0229.0)	The electrical service and distribution shall comply with the National Electrical Code (NFPA 70) and the National Electrical Safety Code (ANSIc.2)	X		4.4.1.7 4.4.2.6	7
1232.0	3.7.1 (FRD-0232.0)	Three phase, 60 Hz, grounded wire, 480 volts power, with the ground continued to feed the engine-generator set, UPS, HVAC, and all loads shall be provided at the service entrance of the ASR-11 system electronic housing	X		4.4.1.7	7
1233.0	3.7.1 (FRD-0233.0)	The neutral shall not be continued	X		4.4.1.7	7
1234.0	3.7.1 (FRD-0234.0)	Step-down transformers configured as separately derived sources, 480 volt delta primary to 208Y/120 volt or 380Y/220 volt connected 4-wire secondary, shall be used at each branch panelboard for loads requiring 208Y/120 or 380Y/220 volt electrical power.	X		4.4.1.7	7
1235.0	3.7.1 (FRD-0235.0)	Neutral grounds for the secondary of step-down transformers shall be connected directly to the facility counterpoise	X		4.4.1.7	7
1246.0	3.7.1.2.b (FRD-0246.0)	Solar cells shall be installed to maximize sunlight collection and not be susceptible to movement by winds	X		4.4.1.6	4
1247.0	3.7.2 (FRD-0247.0)	A secondary surge arrestor, listed and rated in accordance with UL-1449, shall be provided at the power entrance to each ASR-11 system housing in accordance with FAA-STD-019b, paragraph 3.7	X		4.4.1.7	7
1248.0	3.7.3 (FRD-0248.0)	Each ASR-11 system housing shall be provided with an AC service ground in accordance with Table 250-94 of NFPA 70, and with FAA-STD-019b, paragraph 3.13.2	X	X	4.4.1.7 4.4.2.6	7
1249.0	3.7.3.a (FRD-0249.0)	The AC service ground shall be connected to the main counterpoise ground well with hardware permitting it to be disconnected, facilitating independent measurement of the effectiveness of the facility counterpoise system	X		4.4.1.7	7
1251.0	3.7.3.b (FRD-0251.0)	The AC service ground conductors shall be routed through electrically continuous conduit, and bonded to the conduit at each end with the same size cable	X		4.4.1.7	7
1252.0	3.7.3.c (FRD-0252.0)	Hardware provided for this use shall conform to FAA-STD-019b, paragraph 3.1.4.6	X		4.4.1.7	7
1253.0	3.7.4 (FRD-0253.0)	All wiring, cabling, junctions, connectors, and panels shall be properly sized, color coded, and configured in accordance with NFPA 70 and FAA-C-1217e (The color code for the 480 volt conductors for Configuration 1 sites is Brown, Orange, yellow and Configuration 4 sites is Yellow, Brown, Orange.	X	X	4.4.1.7 4.4.2.6	7
1254.0	3.7.5 (FRD-0254.0)	Shared or common neutrals shall not be permitted on branch circuits	X		4.4.1.7	7
1255.0	3.7.5 (FRD-0255.0)	Neutral conductor sizes shall not be smaller than the associated feeder conductors	X		4.4.1.7	7

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
1258.0	3.7.7 (FRD-0258.0)	All incoming main distribution equipment and components shall be Underwriters' Laboratories (UL) rated as "Service Equipment"	X		4.4.1.7	7
1259.0	3.7.7 (FRD-0259.0)	All non-grounded bus bars and conductors shall be copper.	X		4.4.1.7	7
1260.0	3.7.7 (FRD-0260.0)	All bus bars for grounded conductors and lugs in safety switches are permitted to be A1/Cu rated. Electrical circuits, including circuit breakers, fuses, wiring and distribution shall be configured to ensure that a single, overcurrent protective device, which in response to a fault, will remove only a minimum amount of equipment from service.	X		4.4.1.7	7
1260.1	3.7.7 (FRD-0260.1)	For sites which utilize configuration 4: The design shall be based on an EDSA Protective Device Coordination Analysis and an EDSA Three-Phase, Short Circuit Analysis of the facility power distribution system.	X		4.4.1.7	4
1261.0	3.7.8 (FRD-0261.0)	Panelboards shall conform to FAA-C-1217e, paragraph 4.10 and be equipped as follows: a) Main circuit breakers for each panelboard b) Circuit breakers for all loads in accordance with FAA-C-1217e, paragraph 4.10 c) Breaker mounting hardware for mounting breakers for the full capacity of the panel d) 20% minimum spare breaker capacity to accommodate future growth	X		4.4.1.7	7
1262.0	3.7.9 (FRD-0262.0)	The critical power distribution system shall conform to NFPA 70 and FAA-C-1217e	X	X	4.4.1.7 4.4.2.6	4
1263.0	3.7.9 (FRD-0263.0)	The distribution system shall provide independent panelboards for dual channel equipment, if appropriate	X		4.4.1.7	4
1264.0	3.7.9 (FRD-0264.0)	The system shall also have, as a minimum: a) Antenna drive motor breakers b) Cabinet ventilation blower breakers (if applicable), with power wiring separate form the electronics wiring for blowers external to the cabinets. c) Breakers for receptacles installed in accordance with NFPA 70	X	X	4.4.1.7 4.4.2.6	7
1265.0	3.7.10 (FRD-0265.0)	The non-critical power distribution system shall conform to NFPA 70 and FAA-C-1217e	X	X	4.4.1.7 4.4.2.6	7
1266.0	3.7.10 (FRD-0266.0)	The non-critical power distribution system shall have, as a minimum: a) Lighting circuit breakers b) Receptacle circuit breakers c) HVAC circuit breakers d) Tower auxiliary circuit breakers e) Cabinet utility receptacle circuit breakers (if required)	X		4.4.1.7	4

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
1267.0	3.7.11 (FRD-0267.0)	All cabling shall be provided raceways or tray supports appropriate to the cabling, and in accordance with the provisions stated in 3.7.11.1-4, in order to provide protection against both environmental and physical damage	X		4.4.1.7	7
1268.0	3.7.11.1 (FRD-0268.0)	All power cabling shall be routed inside ferrous metal raceways	X		4.4.1.7	7
1269.0	3.7.11.2 (FRD-0269.0)	Power distribution and control circuits that use AC power shall be routed in separate raceways from signal and DC powered control circuit wiring	X		4.4.1.7	7
1270.0	3.7.11.3 (FRD-0270.0)	Raceways appropriate to the application shall be provided for all interior wiring	X		4.4.1.7	7
1271.0	3.7.11.3.a (FRD-0271.0)	Routing of all interior wiring and cabling shall conform to FAA-C-1217e, paragraph 4.6	X		4.4.1.7	7
1272.0	3.7.11.3.b (FRD-0272.0)	Raceways, wireways, and tray system grounding and bonding shall be in accordance with FAA-STD-020b, paragraph 3.9	X		4.4.1.7	7
1273.0	3.7.11.3.b (FRD-0273.0)	Bonding of raceways, wireways, and trays shall be accomplished by a method that provides the required degree of mechanical strength, achieves and maintains the low value of low frequency and high frequency impedance required for functioning of the equipment, and is not subject to deterioration through vibration or corrosion in normal use	X		4.4.1.7	7
1274.0	3.7.11.3.c (FRD-0274.0)	Feeder conductors and branch conductors shall not be run in the same raceways	X		4.4.1.7	7
1275.0	3.7.11.4 (FRD-0275.0)	Raceways appropriate to the application shall be provided for all external wiring	X		4.4.1.7	7
1276.0	3.7.11.4.a (FRD-0276.0)	Service entrance wiring shall be routed underground in conduit in accordance with FAA-C-1217e, paragraph 4.9.1	X		4.4.1.7	7
1277.0	3.7.11.4.b (FRD-0277.0)	Galvanized steel conduit, in accordance with FAA-STD-019b, paragraph 3.11.5, shall be used to route all cabling on the exterior of housings, between individual housings, and for antenna tower cabling, with the exception of RF coaxial cable for the beacon antenna system	X		4.4.1.7	7
1278.0	3.7.11.4.c (FRD-0278.0)	The conduit shall be bonded to the site grounding system per FAA-STD-019b, paragraph 3.2.3	X		4.4.1.7	7
1281.0	3.7.11.4.e (FRD-0281.0)	Conduit for cabling between the radar electronic equipment housing and the antenna tower shall be routed in an above ground support system designed to support the waveguide and coaxial cable antenna feed system	X		4.4.1.7	7
1281.1	3.7.12 (FRD-0281.1)	Exterior site security lighting shall be provided throughout the site for employee safety.		X	4.4.2.6 4.4.2.7	7
1282.0	3.7.12 (FRD-0282.0)	On a site-optional basis, security lighting shall be controlled by a key-operated switch beside the access road at the site perimeter (outside of the security fence, if applicable), or by a photocell-controlled switch, based on the requirements of the specific site		X	4.4.2.7	7

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
1283.0	3.7.12.a (FRD-0283.0)	Lighting shall provide a minimum of 0.5 foot-candle (5 lx) initial and 0.4 foot-candle (4 lx) maintained when measured vertically or horizontally from a point 6 inches above the ground		X	4.4.2.5 4.4.2.6	7 8
1285.0	3.8.1 (FRD-0285.0)	A signal-grounding system, in accordance with FAA-STD-019b and FAA-STD-020b shall be provided at each site, with a multi-point ground system for high frequency circuits, and a single-point ground system for low frequency circuits	X		4.4.1.7	7
1286.0	3.8.1 (FRD-0286.0)	Color codes and signs shall be in accordance with the requirements of FAA-STD-019b and FAA-STD-020b	X		4.4.1.7	7
1287.0	3.8.1.1 (FRD-0287.0)	A multi-point ground system shall be provided in accordance with FAA-STD-019b, paragraph 3.11, and FAA-STD-020b, paragraph 3.8	X		4.4.1.7	7
1288.0	3.8.1.1 (FRD-0288.0)	The multi-point ground system shall be connected to the ground counterpoise system in two places, at opposite sides of the radar housing, per FAA-STD-019b, paragraph 3.11.2	X		4.4.1.7	7
1289.0	3.8.1.2 (FRD-0289.0)	A single-point ground system shall be provided in accordance with FAA-STD-019b, paragraph 3.12	X		4.4.1.7	7
1290.0	3.8.1.2 (FRD-0290.0)	Each grounding conductor shall be electrically isolated in a continuous run from the equipment cabinet to the closest branch ground-plate	X		4.4.1.7	7
1291.0	3.8.2 (FRD-0291.0)	Each ASR-11 setting, including all ASR-11 components, shall be provided with an earth electrode system (counterpoise) in accordance with FAA-STD-019b, paragraph 3.10	X		4.4.1.7	7
1299.0	3.8.2.e (FRD-0299.0)	The resistance to earth of the counterpoise shall not be over 10 Ω	X		4.4.1.7	7
1299.1	3.8.2.f (FRD-0299.1)	For sites which utilize configuration 4, all ground wiring which connects to the counterpoise shall be 4/0 AWG or greater.	X		4.4.1.7	7
1299.4	3.8.2.g (FRD-0299.4)	Each corner of fence post and the center of each fence side shall be connected to the external counterpoise by exothermic weld, using 4/0 AWG bare stranded copper cable.	X		4.4.1.7	7
1300.0	3.8.3 (FRD-0300.0)	Bonding shall be provided in accordance with FAA-STD-019b or FAA-STD-020b	X		4.4.1.7	7
1301.0	3.8.3.a (FRD-0301.0)	All exterior bonds shall conform to FAA-STD-019b, paragraph 3.14	X		4.4.1.7	7
1302.0	3.8.3.b (FRD-0302.0)	Surface preparation and restoration/preservation for each bonded area shall be in accordance with FAA-STD-019b, paragraph 3.14.14	X		4.4.1.7	7
1303.0	3.8.3.c (FRD-0303.0)	Each bond shall exhibit a resistance of less than 1 mΩ when measured with a four terminal mΩ-meter	X		4.4.1.7	7
1304.0	3.8.3.d (FRD-0304.0)	All interior bonds shall conform to FAA-STD-020b, paragraph 3.9	X		4.4.1.7	7

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
1304.1	3.8.3.e (FRD-0304.1)	For sites which utilize configuration 4, all cable terminations shall be made with Thomas & Betts Long Barrel connectors using a Thomas & Betts 14-ton manual hydraulic crimping tool (T&B P/N TBM14M) and Thomas & Betts crimping tool dies (T&B P/N 155XX) for specific wire sizes.	X		4.4.1.7	7
1305.0	3.8.4 (FRD-0305.0)	All metallic non-current-carrying parts of electrical equipment shall be grounded in accordance with NFPA 70 and FAA-C-1217e	X	X	4.4.1.7 4.4.2.6	7
1306.0	3.8.4.a (FRD-0306.0)	Electrical circuits shall not share equipment grounding conductors	X		4.4.1.7	7
1307.0	3.8.4.b (FRD-0307.0)	Each over current device shall have its own equipment grounding conductor, whether single phase-single pole, single phase-two pole, or three phase	X		4.4.1.7	7
1308.0	3.8.4.c (FRD-0308.0)	The equipment grounding conductor shall be installed in the same conduit as its related branch and feeder conductors	X		4.4.1.7	7
1309.0	3.8.4.d (FRD-0309.0)	Metal conduit housing the equipment grounding conductor shall be electrically continuous, forming a parallel path to the equipment grounding conductor, except as specifically permitted by NFPA 70	X	X	4.4.1.7 4.4.2.6	7
1310.0	3.8.4.e (FRD-0310.0)	Where parallel feeders are installed in more than one raceway, a full-sized equipment grounding conductor shall be installed in each raceway	X		4.4.1.7	7
1311.0	3.8.4.f (FRD-0311.0)	Equipment grounding conductors shall be green insulated copper conductors	X		4.4.1.7	
1312.0	3.8.4.h (FRD-0312.0)	When these conductors are not sized, or are not shown on construction drawings, conductors shall be sized in accordance with paragraph 250-95 of NFPA 70	X	X	4.4.1.7 4.4.2.6	7
1313.0	3.8.5 (FRD-0313.0)	All ASR-11 system components shall be protected against hazards caused by lightning in accordance with FAA-STD-019b, paragraphs 3.9.10 and 3.9.11, and NFPA 780	X	X	4.4.1.7 4.4.2.6	7
1314.0	3.8.5 (FRD-0314.0)	Hardware and cabling used to construct the lightning protection system shall be a listed product under UL-96A	X		4.4.1.7	7
1315.1	3.8.5.a (FRD-0315.1)	For Configuration 4 sites, four down conductors shall be provided one at each of the four air terminals, which meet the requirements of FAA-STD-019B, paragraph 3.9.11.	X		4.4.1.7	7
1316.0	3.8.5.a (FRD-0316.0)	All down conductors for the antenna tower shall be exothermically welded to the counterpoise.	X		4.4.1.7	7
1317.0	3.8.5.a (FRD-0317.0)	The size, material, and installation of lightning protection components shall be in accordance with NFPA 780 and FAA-STD-019b	X	X	4.4.1.7 4.4.2.6	7
1318.0	3.8.5.b (FRD-0318.0)	The bottom of the tower stairway shall be bonded to the counterpoise in accordance with NFPA 780	X	X	4.4.1.7 4.4.2.6	7

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
1320.1	3.8.5.d (FRD-0320.1)	For sites, which utilize configuration 4, all waveguides to the antennas shall be grounded at three points: near the antenna, at the vertical-to-horizontal transition near the base of the tower, and at the waveguide entry point.	X		4.4.1.7	7
1320.2	3.8.5.d (FRD-0320.2)	metallic supporting structures for waveguides shall be electrically continuous and connected to the exterior earth electrode subsystem at the first and the last support columns as a minimum. The wire leads are run as direct as possible.	X		4.4.1.7	7
1320.3	3.8.5.d (FRD-0320.3	Waveguides shall be grounded with solid copper strap or copper wire at least equal to 4/0 AWG. Braid or fine-stranded wire is not acceptable.	X		4.4.1.7	7
1320.4	3.8.5.d (FRD-0320.4)	All bends of ground conductors shall have a radius of 8 inches or greater and no bends more than 90 degrees.	X		4.4.1.7	7
1320.5	3.8.5.d (FRD-0320.5)	Waveguides shall be properly bonded to the waveguide entrance panel and the panel connected by the most direct route to the earth electrode subsystem using a 4/0 stranded copper cable.	X		4.4.1.7	7
1321.0	3.9 (FRD-0321.0)	The ASR-11 data transmission system(s) shall provide for the connectivity between ASR-11 elements (e.g. ASR-11 digital output ports to radar control panels, OMTs, and the SDT), and to the external interfaces defined in the SRD, paragraph 3.6		X	4.4.1.1 4.4.1.2 4.4.1.3 4.4.1.4	6
1323.0	3.9 (FRD-0323.0)	The site unique transmission system configurations (mix of local and remote) shall be as identified in each SATP	X		4.4.1.1	6
1325.0	3.9.1.a (FRD-0325.0)	The ASR-11 system shall include all remoting media, modems, transceivers, amplifiers, cables, conduits, and trenching as required to transmit ASR-11 signals for the local data transmission system	X		4.4.1.1	6
1326.0	3.9.1.b (FRD-0326.0)	The site specific local data transmission system characteristics shall be as identified in the SATP, with preference given to the use of fiber optic based systems	X		4.4.1.1	6
1327.0	3.9.2 (FRD-0327.0)	The ASR-11 remote connectivity data transmission system shall be comprised of the external transmission modem systems defined in the SRD paragraph 3.10	X		4.4.1.1 4.4.1.2 4.4.1.3 4.4.1.4	6
1328.0	3.9.2 (FRD-0328.0)	A communications system shall be provided that includes all telephones, wiring, and jacks necessary to permit clear communications between the remote locations and the antenna tower mezzanine and radar electronics equipment housing	X		4.4.1.6	8
1329.0	3.9.2 (FRD-0329.0)	The system shall comply with NFPA 70 and ANSIc.2		X	4.4.2.6	7

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
1330.0	3.9.2 (FRD-0330.0)	Fiber-optic cabling and equipment capable of supporting transmission of all radar and communications information shall be provided between the radar site and the associated ATC facilities where feasible, or as determined during the site survey process	X		4.4.1.1	6
1335.0	3.11.a (FRD-0335.0)	The walkway shall extend to a cargo pad directly under the hoist to permit movement of heavy equipment between the electronic equipment housing and the hoist		X	4.4.2.6	7
1339.0	3.12 (FRD-0339.0)	Security fencing shall be provided around the perimeter of the ASR-11 site in accordance with FAA-E-2056, when determined necessary		X	4.4.2.7	7
1339.1	3.1.2 (FRD-0339.1)	For sites that utilize configuration 4, razor wire shall be provided and installed when determined to be required for site security.		X	4.4.2.7	7
1340.0	3.12.a (FRD-0340.0)	At the radar site, a personnel gate and a vehicular gate shall be provided and equipped to accommodate a Best Lock padlock		X	4.4.2.7	7
1341.0	3.12.b (FRD-0341.0)	Government approved controlled area and hazard signs shall be posted along the perimeter of all fencing		X	4.4.2.7	7
1342.0	3.12.c (FRD-0342.0)	The MRSM site shall be enclosed by a security fence when determined necessary during the site survey, with a gate large enough for a maintenance vehicle, and secured by a Best Lock padlock		X	4.4.2.7	7
1352.0	3.14.f (FRD-0352.0)	A cargo pad shall be provided at the tower under the hoist	X		4.4.1.6	7
1356.0	3.15 (FRD-0356.0)	Key-compatible Best Lock padlocks shall be provided for fence gates, fuel tanks, and other locking requirements		X	4.4.2.7	7
1357.0	3.15 (FRD-0357.0)	Each exterior equipment panel or case shall be provided with hardware for locking with BEST Lock padlocks		X	4.4.2.7	7
1358.0	3.16.a (FRD-0358.0)	MTI reflector electronics shall be mounted in close proximity to its antenna	X		4.4.1.6	4
1359.0	3.16.a (FRD-0359.0)	MTI reflector electronics shall be housed in a weather-proof case	X		4.4.1.6	4
1362.0	3.16.b (FRD-0362.0)	Where use of existing structures is not feasible or desirable, a mounting, such as a pole or tower with appropriate foundation and structural support, shall be provided	X		4.4.1.6	4
1363.0	3.16.c (FRD-0363.0)	OSHA-compliant safety climbing devices shall be installed as required on poles or similar mountings	X	X	4.4.1.6 4.4.2.6	7
1364.0	3.16.d (FRD-0364.0)	The MTI reflectors shall be installed so as not to be susceptible to movement by winds normally expected in that locality	X		4.4.1.6	4
1368.0	3.18.a (FRD-0368.0)	All manufacturer's instructions relating to the use, maintenance, and safety requirements for batteries shall be provided at each site		X	4.4.2.6	7
1369.0	3.18.b (FRD-0369.0)	Any safety equipment recommended by OSHA regulations or by the manufacturer for the specific batteries installed at a given site shall be provided for that site		X	4.4.2.6	7

REQ #	REQUIREMENTS paragraph ref:	PERFORMANCE THRESHOLD	OT&E		SUBTEST PARAGRAPH	COI #
			I	O		
1370.0	3.18.c (FRD-0370.0)	Materials shall meet UL 1778 requirements			4.4.2.6	7

APPENDIX B

AIR TRAFFIC OPERATIONAL TEST QUESTIONNAIRES

APPENDIX B

Air Traffic Operational Test Questionnaires

Name _____
Date _____

Interface

1. Does the combined automation and ASR-11 system provide the following?

   a. The capability to identify, track and control aircraft in your sector or surveillance area?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

b. Observable information on the controller displays? Full data block, limited data block, partial data block, single symbol and Mode C?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

c. The display of weather information?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

d. Did you observe full data block, limited data block, partial data block, single symbol and Mode C, in areas and at times you should have?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

Primary Radar Coverage
Note: This section addresses verifiable primary radar targets.

1. Did you observe targets in all four quadrants of the radar coverage envelope (360 degrees)?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

2. Did you observe targets at different ranges (.5-60 nm) from the radar site?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

3. Did you observe altitude readout information at varying heights (up to 24,000 feet) throughout the coverage area?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

4. Did you observe any holes (loss of target areas) in the radar coverage area?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

Primary Radar Target Detection

1. Did you observe primary targets of varying speeds at different altitude, ranges and courses including tangential in the areas listed below?

a. Clear Areas (No Clutter)

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

b. Clutter Areas (sea, terrain, precipitation)

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

2. Could you track primary targets through areas of clutter?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

3. Did you observe primary targets from aircraft of different sizes at different altitudes and ranges in the areas listed below?

a. Clear

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

b. Clutter

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

Primary Radar False Alarm Rate

The definition of the following terms are:

Angels; Echos caused by meteorological conditions, such as clouds, lightning, or by birds or insects.
Distributed Precipitation; Describes the radar echo returned by uniform weather over a large area.
Cellular Precipitation; Describes the radar echo returned by an individual shower or thunderstorm.

1. Did you observe the presence of false targets?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

2. Could you determine what the false target was reflected from?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

3. Did you observe a large number of false targets?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

4. Do these false targets have an adverse effect on the following:

a. Tracking a primary target?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

b. Identifying a primary target?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

c. Providing traffic advisories?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

d. Overall control of air traffic?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

5. Could you recognize false targets caused by terrain and sea clutter?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

6. Could you recognize false targets caused by vehicular traffic and angels?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

7. Could you recognize false targets caused by distributed precipitation?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

8. Could you recognize false targets caused by cellular precipitation?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

Primary Radar Accuracy

1. Did the ASR-11 provide the information needed for the following:

    a. To adequately separate two aircraft?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

    b. Radar vectoring?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

    c. To determine when an aircraft was clear of an obstruction?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

d. To observe a target coincidental with the aircraft's known position?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

e. To determine range and azimuth of a target?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

f. To determine target degradation in the presence of clutter?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

Range and Azimuth Resolution

1. Could you distinguish between two beacon targets that were at the same azimuth and separated by 1/8 nm in range?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

2. Did you observe any beacon code or data block swapping?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

Beacon Code Validation and Accuracy

1. Did you observe any incorrect responses when a target squawked ident?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

2. Did you observe any incorrect beacon codes for the targets displayed?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

3. Was the reported beacon altitude consistent?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

Beacon Splits and False Reports

1. Did you observe any beacon splits during this demonstration?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

2. Did you observe any false beacon reports?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

3. Did you observe any false emergency reports (7500, 7600, or 7700 codes)?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

Weather Detection and Processing

1. Were you able to observe any known weather?

Yes _____ No _____

Comments:

_____
_____
_____
_____
_____
_____

2. Were you able to distinguish between different weather levels?

Yes _____ No _____

Comments:

_____
_____
_____
_____
_____
_____

3. Was the weather contour well defined?

Yes _____ No _____

Comments:

_____
_____
_____
_____
_____
_____

APPENDIX C

AIRWAYS FACILITIES OPERATIONAL TEST QUESTIONNAIRES

Appendix C
Airways Facilities Operational Test Questionnaires

Name _____
Date _____

Built In Test (BIT) / Fault Isolation (FI)

1. Did you understand how to use the RMS menus on the OMT/SCDI to initiate BIT and FI?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

2. Were BIT results reported consistently at different locations?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

3. Did FI call out the correct failed parts during the maintainability demonstration?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

4. Were all faults able to be isolated using either automatic (BIT/FI) or manual (technical instruction manual procedures) means?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

5. Did you observe false BIT alarms? If so, provide details.

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

6. Were Line Replaceable Units (LRUs) correctly and clearly marked to allow identification during fault isolation?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

7. Did you observe multiple fault messages for the same fault indication?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

Manuals

1. Were the procedures in the manuals clearly written?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

2. Were the procedures in the manuals accurate for preventative/corrective maintenance and built in test/fault isolation?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

3. Were the procedures consistent with the training that you received?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

Scheduled Maintenance Tasks

1. Were the scheduled maintenance tasks clearly identified?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

Training - SCDI Operation, VSPs,

1. Based on the training, are you able to maintain the PSR? If not, provide details.

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

2. Based on the training, are you able to maintain the MSSR? If not, provide details.

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

3. Based on the training, are you able to maintain the local and remote SCDIs? If not, provide details.

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

4. Based on the training, are you able to maintain components of the Antenna Pedestal Group? If not, provide details.

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

5. Based on the training, are you able to maintain the power subsystem components (i.e. UPS, E/G, etc.)? If not, provide details.

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

6. Based on the training, are you able to maintain the data translation equipment (i.e. SDT, DVGs) and data communications equipment? If not, provide details.

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

7. Based on training, do you understand the meaning of all customer adaptation parameters? If not, provide details.

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

8. Were there any maintenance tasks which required training that you did not receive? If so, provide details.

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

Spares/Supplies

1. Were all of the spare LRUs, allocated to the site, available at the time of the test?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

2. Were the spare LRUs, used during testing, in working order?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

3. Were the markings (i.e. reference designators and part numbers) on the spare LRUs consistent with documentation?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

4. Were replacement LRU's required that were not available as spares?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

5. Were all needed consumable supplies (e.g., oil, filters) properly identified in the site supply list?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

Tools

1. Were the tools listed in the manuals available onsite to perform the preventative maintenance tasks?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

2. Were the available tools adequate for the performance of the maintenance tasks?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

Certification

1. Did the system provide adequate information for you to certify the radar and beacon performance for use by Air Traffic?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

2. Was there sufficient adjustability in the ASR-11 adaptation parameters to calibrate the ASR-11 certification screens to an independent source?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

Working Environment

1. Did you have sufficient room around the equipment to perform the maintenance tasks?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

2. Was the necessary lighting (either from a permanent or temporary source) available in the work areas to do your job? If not, where was more lighting needed?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

3. Was the noise in the shelter work areas within tolerable limits?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

4. Was the noise in the pedestal work areas within tolerable limits?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

5. Was the noise in the engine generator work areas within tolerable limits?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

6. Were you able to locate eye washes in the shelter? Were the eye washes in working order?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

7. Was hearing protection available in noisy areas?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

8. Were any hazardous conditions noted during maintenance activities?

Yes _____ No _____ Not Observed _____

Comments:

_____
_____
_____
_____
_____
_____

APPENDIX D

ASR-11 HUMAN FACTORS ASSESSMENT

APPENDIX D
ASR-11 Human Factors Assessment
Radar Control Panel

Name: _____
Date: _____

Instructions: The purpose of this questionnaire is to assess the human factors design of the Radar Control Panel (RCP). Please use the RCP and then complete this questionnaire.

The left column consists of human factors considerations drawn from the "Human Factors Checklist for the Design and Evaluation of Air Traffic Control Systems" developed by the John A. Volpe National Transportation System Center. The list has been tailored for the ASR-11 system.

The middle column requests your assessment of the RCP design. Is it satisfactory (S), unsatisfactory (U), or is the consideration not applicable (N/A)? The right column provides space for your comments or notes.

	Human Factors Consideration	Design Assessment	Comments/Notes
No.	**Visual Displays**		
1.	Information that the operator needs, for example, alerts, does not disappear from the display without being deleted or suppressed by the operator.	S___ U___ N/A___	
2.	The display responds quickly.	S___ U___ N/A___	
3.	When the meaning of the color is critical, color is used redundantly with another type of visual cue, such as shape, backlighting, or location.	S___ U___ N/A___	
4.	The operator is able to recognize and differentiate between color codes under anticipated lighting conditions, i.e., range of 5 to 6000 foot-candles.	S___ U___ N/A___	
5.	The operator will not need to identify more than five colors (to interpret the meaning of the color when it stands alone).	S___ U___ N/A___	
6.	Color displays are readable and adequately bright under all anticipated lighting conditions.	S___ U___ N/A___	
7.	Characters and symbols can be read easily under all anticipated lighting conditions (e.g., from dim light to direct sunlight, if applicable).	S___ U___ N/A___	
8.	Data changes are emphasized effectively so that it attracts the operator's attention.	S___ U___ N/A___	
9.	Acronyms used in the new display are intuitive and easy to understand.	S___ U___ N/A___	
10.	Terms used in the new display are intuitive and easy to understand.	S___ U___ N/A___	
11.	Visual displays and their labels are sufficiently visible under all anticipated lighting conditions.	S___ U___ N/A___	
12.	Labels, terms, and abbreviations are used consistently across the display.	S___ U___ N/A___	
13.	Only one abbreviation is used for each word or item and abbreviations are used consistently on all visual displays.	S___ U___ N/A___	
14.	Visual displays maintain good image quality even at the dimmest possible setting.	S___ U___ N/A___	

	Human Factors Consideration	Design Assessment	Comments/Notes
15.	Information that the operator must read and understand quickly, such as alarms or critical error messages, never blinks or flashes rapidly.	S___ U___ N/A___	
16.	Highlighting and blinking are used sparingly.	S___ U___ N/A___	
17.	Alerts have a low incidence of false alarms.	S___ U___ N/A___	
18.	The color red is used only for warning/danger.	S___ U___ N/A___	
19.	Yellow is used to indicate caution. For the ASR-11, yellow indicates the component is in maintenance status and is not available for use.	S___ U___ N/A___	
20.	Green is used to indicate for normal/ready status.	S___ U___ N/A___	
21.	No more than two levels of blinking are used.	S___ U___ N/A___	
22.	If blinking is used, it is cancelable by the operator.	S___ U___ N/A___	
23.	This design effectively directs the operator's attention by means of alerting, coding, and emphasis techniques.	S___ U___ N/A___	
24.	Information that is blinking has an "on" period that is at least as long as the "off" period. (The recommended rate is 2-3 Hz. Hertz =one cycle per second).	S___ U___ N/A___	
No.	**Auditory Alerts**		
1.	Auditory alerts are used only when necessary and as a redundant warning mechanism.	S___ U___ N/A___	
2.	The meanings of auditory alerts are readily apparent.	S___ U___ N/A___	
3.	Auditory signals are not masked by other auditory alerts or background noise.	S___ U___ N/A___	
4.	The number of auditory signals (e.g., warnings, alerts) that the operator may need to identify is fewer than five.	S___ U___ N/A___	
5.	Auditory alerts are easily discernible from other signals or noise.	S___ U___ N/A___	

	Human Factors Consideration	Design Assessment	Comments/Notes
6.	Auditory alerts do not provide more information than is necessary.	S___ U___ N/A___	
7.	Auditory alerts are consistently implemented throughout the system.	S___ U___ N/A___	
8.	The information contained in an auditory alert is also displayed visually.	S___ U___ N/A___	
9.	Auditory alerts are only used when immediate action is required.	S___ U___ N/A___	
10.	Auditory alerts are cancelable by the operator.	S___ U___ N/A___	
11.	Auditory alerts sound until canceled by the operator.	S___ U___ N/A___	
12.	The pause between a repeating auditory signal is less than or equal to three seconds.	S___ U___ N/A___	

ASR-11 Human Factors Assessment
Operator Maintenance Terminal

Name: _____
Date: _____

Instructions: The purpose of this questionnaire is to assess the human factors design of the Operator Maintenance Terminal (OMT). Please use the OMT and then complete this questionnaire.

The left column consists of human factors considerations drawn from the "Human Factors Checklist for the Design and Evaluation of Air Traffic Control Systems" developed by the John A. Volpe National Transportation System Center. The list has been tailored for the ASR-11 system.

The middle column requests your assessment of the OMT design. Is it satisfactory (S), unsatisfactory (U), or is the consideration not applicable (N/A)? The right column provides space for your comments or notes.

	Human Factors Consideration	Design Assessment	Comments/Notes
No.	**Visual Displays**		
1.	Information does not disappear from the display without being deleted or suppressed by the operator.	S___ U___ N/A___	
2.	Essential information is never blocked or obstructed by other information.	S___ U___ N/A___	
3.	All information that the operator needs to accomplish a task that is essential and time-critical is located on a single page or in a small set of windows.	S___ U___ N/A___	
4.	Visual displays provide necessary information in a usable form when it is needed.	S___ U___ N/A___	
5.	Display clutter is not a problem.	S___ U___ N/A___	
6.	Symbols chosen for the display are intuitive so that the operator can interpret them quickly and accurately.	S___ U___ N/A___	
7.	When the meaning of the color is critical, color is used redundantly with another type of visual cue.	S___ U___ N/A___	
8.	The operator is able to recognize and differentiate between color codes under anticipated lighting conditions.	S___ U___ N/A___	
9.	The operator will not need to identify more than five colors (to interpret the meaning of the color when it stands alone).	S___ U___ N/A___	
10.	Color displays are readable and adequately bright under all anticipated lighting conditions.	S___ U___ N/A___	
11.	When the operator must distinguish between the color of characters and symbols, small blue characters and symbols are not used.	S___ U___ N/A___	
12.	Characters and symbols can be read easily under all anticipated lighting conditions (e.g., from dim light to direct sunlight, if applicable).	S___ U___ N/A___	
13.	Saturated (i.e., vivid) red and blue are never presented next to each other.	S___ U___ N/A___	
14.	Computer displays and controls are clearly visible and easy to use under all anticipated lighting conditions.	S___ U___ N/A___	
15.	The active window is highlighted to distinguish it from inactive windows.	S___ U___ N/A___	
16.	The relationship between different windows is clear to the operator.	S___ U___ N/A___	

	Human Factors Consideration	Design Assessment	Comments/Notes
17.	Data changes are emphasized effectively so that it attracts the operator's attention.	S___ U___ N/A___	
18.	If size coding is used, it is limited to two widely different sizes.	S___ U___ N/A___	
19.	Formats used within data fields are consistent from one display to another.	S___ U___ N/A___	
20.	Visual displays and their labels are sufficiently visible under all anticipated lighting conditions.	S___ U___ N/A___	
21.	Labels, terms, and abbreviations are used consistently across the display.	S___ U___ N/A___	
22.	Only one abbreviation is used for each word or item and abbreviations are used consistently on all visual displays.	S___ U___ N/A___	
23.	Punctuation is used conservatively and consistently.	S___ U___ N/A___	
24.	Continuous text is presented in mixed upper-and-lower case.	S___ U___ N/A___	
25.	Visual displays maintain good image quality even at the dimmest possible setting.	S___ U___ N/A___	
26.	Information that the operator must read and understand quickly, such as alarms or critical error messages, never blinks or flashes rapidly (i.e., faster than 5Hz.)	S___ U___ N/A___	
27.	Highlighting and blinking are used sparingly.	S___ U___ N/A___	
28.	Alerts have a low incidence of false alarms.	S___ U___ N/A___	
29.	The same color coding strategy is applied to every display used by the same operator.	S___ U___ N/A___	
30.	The color red is used only for warning/danger.	S___ U___ N/A___	
31.	Yellow is used to indicate caution.	S___ U___ N/A___	
32.	Green is used to indicate for normal/ready status.	S___ U___ N/A___	
33.	No more than two levels of blinking are used.	S___ U___ N/A___	
34.	If blinking is used, it is cancelable by the operator.	S___ U___ N/A___	
35.	This design effectively directs the operator's attention by means of alerting, coding, and emphasis techniques.	S___ U___ N/A___	
36.	Information that is blinking has an "on" period that is at least as long as the "off" period.	S___ U___ N/A___	
No.	**Auditory Alerts**		

	Human Factors Consideration	Design Assessment	Comments/Notes
1.	Auditory alerts are used as a redundant warning mechanism.	S___ U___ N/A___	
2.	The meanings of auditory alerts are readily apparent.	S___ U___ N/A___	
3.	Auditory signals are not masked by other auditory alerts or background noise.	S___ U___ N/A___	
4.	The number of auditory signals (e.g., warnings, alerts) that the operator may need to identify is fewer than five.	S___ U___ N/A___	
5.	Auditory alerts are easily discernible from other signals or noise.	S___ U___ N/A___	
6.	The same auditory signal always indicates the same information.	S___ U___ N/A___	
7.	Auditory alerts are consistently implemented throughout the system.	S___ U___ N/A___	
8.	The information contained in an auditory alert is also displayed visually.	S___ U___ N/A___	
9.	Auditory alerts are only used when immediate action is required.	S___ U___ N/A___	
10.	Auditory alerts are cancelable by the operator.	S___ U___ N/A___	
11.	Auditory alerts sound until canceled by the operator.	S___ U___ N/A___	
12.	The pause between a repeating auditory signal is less than or equal to three seconds.	S___ U___ N/A___	
No.	**Data Entry Procedures**		
1.	The number of keystrokes (or other control actions) necessary to input data and the amount and complexity of data entry is kept to a minimum.	S___ U___ N/A___	
2.	This system makes it easy to recover from data-entry errors.	S___ U___ N/A___	
3.	Keystrokes or other data-entry actions are echoed immediately on the screen, that is, there is no delay in providing a legible representation of what has been entered.	S___ U___ N/A___	
4.	The data entry method helps to minimize errors and provides for quick, simple data editing and correction.	S___ U___ N/A___	
5.	This user interface system queries the operator at critical choice points, e.g., "Are you sure you want to turn the antenna off?"	S___ U___ N/A___	
6.	The operator receives appropriate feedback on data acceptance or rejection.	S___ U___ N/A___	

	Human Factors Consideration	Design Assessment	Comments/Notes
7.	The computer does not erase all or part of any erroneous data entry.	S___ U___ N/A___	
8.	The operator controls the pace of data entry; that is, the computer does not impose time limits or time outs.	S___ U___ N/A___	
9.	The computer does not restrict the order in which data items are entered.	S___ U___ N/A___	
10.	Data processing is initiated only after an explicit command from the operator.	S___ U___ N/A___	
11.	Boundaries indicate where to enter the data and show maximum field length.	S___ U___ N/A___	
12.	A cursor appears to indicate data-entry mode and location.	S___ U___ N/A___	
13.	Field labels use accepted terminology and are used consistently.	S___ U___ N/A___	
14.	Command execution requires minimal operator action.	S___ U___ N/A___	
15.	The consequences of destructive commands are explained.	S___ U___ N/A___	
16.	Destructive commands require operator confirmation of intention before they are executed.	S___ U___ N/A___	
17.	Command execution always occurs by explicit operator action, never as a by-product of another action.	S___ U___ N/A___	
18.	The operator can suspend/interrupt or cancel/undo a transaction in progress.	S___ U___ N/A___	
19.	Command ordering is consistent from screen to screen/window to window.	S___ U___ N/A___	
20.	Command labels use accepted terminology and are used consistently.	S___ U___ N/A___	
21.	Commands are consistent in their placement across multiple windows; in their wording; and in their method of activation.	S___ U___ N/A___	
22.	The computer indicates the current operational mode.	S___ U___ N/A___	
23.	Entry of long sequences of command parameters is not required.	S___ U___ N/A___	
24.	Upper- and lower-case letters are accepted as equivalent when the operator is entering a command or command parameter.	S___ U___ N/A___	
25.	Feedback is always given to indicate that the computer has initiated a command.	S___ U___ N/A___	

	Human Factors Consideration	Design Assessment	Comments/Notes
26.	Commands should be stated in the affirmative; that is, they should tell the operator what to do, rather than what not to do.	S___ U___ N/A___	
27.	Error messages are provided whenever needed.	S___ U___ N/A___	
28.	Error messages are direct and precise.	S___ U___ N/A___	
29.	Error messages are presented immediately after an error's occurrence.	S___ U___ N/A___	
30.	Error messages are not redundant.	S___ U___ N/A___	
31.	Guidance messages are presented in mixed upper and lower case.	S___ U___ N/A___	
32.	Messages about limits not met or exceeded specify the appropriate range for data entry.	S___ U___ N/A___	
33.	Questionable data entries elicit cautionary messages.	S___ U___ N/A___	
34.	Feedback regarding processing delays specifies the process, the length of the delay, and completion of the process.	S___ U___ N/A___	
No.	**Data Entry and Control Devices-Keyboards/Mice**		
1.	If a numeric keypad is provided, it is visually separated from the main keyboard and arranged in a 3 X 3 + 1 matrix.	S___ U___ N/A___	
2.	Keys on keyboards and keypads have no more than two functions.	S___ U___ N/A___	
3.	Nonactive keys are left blank (i.e., not labeled).	S___ U___ N/A___	
4.	The key used to initiate a command is clearly labeled "Enter."	S___ U___ N/A___	
5.	Keyed data are displayed quickly (echoed) on the screen.	S___ U___ N/A___	
6.	Tactile and auditory feedback are provided in response to keystrokes.	S___ U___ N/A___	
7.	The main keyboard is located directly in front of and below the associated visual display, at a comfortable distance from the seated operator's position.	S___ U___ N/A___	
8.	If a mouse is part of the design, it can be used compatibly with all of the tasks the operator is supposed to perform.	S___ U___ N/A___	
9.	Operators can easily and smoothly position the cursor with the mouse.	S___ U___ N/A___	
10.	Movement of the mouse produces cursor movement in the same direction on the display. For example, if the mouse is moved to the left, the cursor moves to the left on the display.	S___ U___ N/A___	

	Human Factors Consideration	Design Assessment	Comments/Notes
11.	The mouse is equally usable with the left or right hand.	S___ U___ N/A___	
12.	The mouse has no sharp edges and meets standards for width (1.6 to 2.8 in.), length (2.8 to 4.7 in.), and thickness (1.0 to 1.6 in.)	S___ U___ N/A___	

ASR-11 Human Factors Assessment
Video Display Control Unit

Name: _____
Date: _____

Instructions: The purpose of this questionnaire is to assess the human factors design of the Video Display Control Unit (VDCU). Please use the VDCU and then complete this questionnaire.

The left column consists of human factors considerations drawn from the "Human Factors Checklist for the Design and Evaluation of Air Traffic Control Systems" developed by the John A. Volpe National Transportation System Center. The list has been tailored for the ASR-11 system.

The middle column requests your assessment of the VDCU design. Is it satisfactory (S), unsatisfactory (U), or is the consideration not applicable (N/A)? The right column provides space for your comments or notes.

	Design	Response	Comments/Notes
No.	**Visual Displays**		
1.	Information that the controller needs does not disappear from the display without being deleted or suppressed by the controller.	S___ U___ N/A___	
2.	The display responds quickly.	S___ U___ N/A___	
3.	All information that a controller needs to accomplish a task that is essential and time-critical is located on a single page or in a single window.	S___ U___ N/A___	
4.	The display provides necessary information in a usable form.	S___ U___ N/A___	
5.	Characters and symbols can be read easily under all anticipated lighting conditions, e.g., from dim light (5 fc) to direct sunlight (6000 fc).	S___ U___ N/A___	
6.	The position and form of displayed objects appear the same to the controller while seated directly in front of the display as they do from other anticipated viewing angles.	S___ U___ N/A___	
7.	Data changes are emphasized effectively so that it attracts the controller's attention.	S___ U___ N/A___	
8.	Acronyms in the new display are intuitive and easy to understand.	S___ U___ N/A___	
9.	Terms used in the new display are meaningful.	S___ U___ N/A___	
10.	Visual displays and their labels are sufficiently visible under all anticipated lighting conditions.	S___ U___ N/A___	
11.	Labels, terms, and abbreviations are used consistently across the display.	S___ U___ N/A___	
12.	Only one abbreviation is used for each word or item and abbreviations are used consistently on all visual displays.	S___ U___ N/A___	
13.	Visual displays maintain good image quality even at the dimmest possible setting.	S___ U___ N/A___	
14.	Information that the controller must read and understand quickly, such as alarms or critical error messages, never blinks or flashes rapidly.	S___ U___ N/A___	
15.	High priority alerts and other critical information are located within the central display area (the central 15 degrees of the area where the controller normally looks, given the normal viewing position).	S___ U___ N/A___	
16.	Highlighting and blinking are used sparingly.	S___ U___ N/A___	

	Design	Response	Comments/Notes
17.	Alerts have a low incidence of false alarms.	S U N/A	
18.	No more than two levels of blinking are used.	S U N/A	
19.	If blinking is used, it is cancelable by the controller.	S U N/A	
20.	This design effectively directs the controller's attention by means of alerting, coding, and emphasis techniques.	S___ U___ N/A___	
21.	Information that is blinking has an "on" period that is at least as long as the "off" period. (The recommended range is 2-3 Hz. Hertz = one cycle per second.)	S___ U___ N/A___	
No.	**Auditory Alerts**		
1.	Auditory alerts are used only when necessary and as a redundant warning mechanism.	S___ U___ N/A___	
2.	The meanings of auditory alerts are readily apparent.	S U N/A	
3.	Auditory signals are not masked by other auditory alerts or background noise.	S___ U___ N/A___	
4.	The number of auditory signals (e.g., warnings, alerts) that the controller may need to identify is fewer than five.	S___ U___ N/A___	
5.	Auditory alerts are easily discernible from other signals or noise.	S___ U___ N/A___	
6.	Auditory alerts do not provide more information than is necessary.	S___ U___ N/A___	
7.	Auditory alerts are consistently implemented throughout the system.	S___ U___ N/A___	
8.	The information contained in an auditory alert is also displayed visually.	S___ U___ N/A___	
9.	Auditory alerts are only used when immediate action is required.	S___ U___ N/A___	
10.	Auditory alerts terminate when canceled by the controller.	S U N/A	
11.	Auditory alerts are cancelable by the controller.	S___ U___ N/A___	
12.	Auditory alerts sound until canceled by the controller.	S U N/A	
13.	The pause between a repeating auditory signal is less than or equal to three seconds.	S___ U___ N/A___	

	Design	Response	Comments/Notes
No.	**Data Entry and Control Devices-Touchscreens**		
1.	Controllers can achieve sufficient touch accuracy with the touchscreen, i.e., active area can be accessed without promoting input error.	S___ U___ N/A___	
2.	Touchscreen displays can be read easily under all anticipated lighting conditions.	S___ U___ N/A___	

APPENDIX E

SYSTEM DISCREPANCY REPORT (SDR)

Appendix D:

TEST DISCREPANCY REPORT

Report #:	Date:	Test ID#:	Originator:
		System Interface:	

Category of Failure -

Hardware ☐
Software ☐
System ☐
an Factors ☐
Other ☐

Test Step:

Discrepancy Title:

Dicrepancy Description:

Action Taken -

Status: Closed ☐ Open ☐ Future Enhancement ☐

Discussion:

Configuration:

Software Version: _____

Signatures -

Test Engineer / Preparer Date Test Manager / Approval Official Date